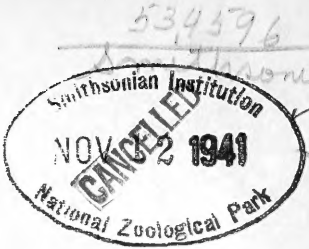




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CONTENTS OF VOLUME XXI.

No. 1.

	PAGE
A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVI. (<i>With Plate XVI and Diagram and Maps.</i>) By Major F. Wall, I.M.S., C.M.Z.S.	1
THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part V. By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.	20
NOTES ON BUTTERFLIES FROM THE NAGA HILLS. Part I. (<i>With Plate A.</i>) By Major H. C. Tytler, 17th In- fantry	48
THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part V. (<i>With Plates XVIII-XXV</i> <i>and Text-figs. 13-19.</i>) By E. Blatter, S.J.	66
THE RESIDENT BIRDS OF THE SAUGOR AND DAMOH DIS- TRICTS, CENTRAL PROVINCES. By R. C. H. Moss King, I.C.S.	87
DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA. Part XIV. By E. Meyrick, B.A., F.R.S., F.Z.S.	104
REPTILES COLLECTED IN CHITRAL. By Major F. Wall, I.M.S., C.M.Z.S.	132
A LIST OF INDIAN FUNGI, CHIEFLY OF THE BOMBAY PRESI- DENCY, WITH THE DESCRIPTION OF TWO NEW SPECIES. (<i>With a Plate.</i>) By E. Blatter, S.J.	146
NOTES ON THE BIRDS OF SEHORE, CENTRAL INDIA, WITH SPECIAL REFERENCE TO MIGRATION. By Captain C. H. T. Whitehead	153
ORCHIDS OF THE BOMBAY PRESIDENCY. Part XII. (<i>With</i> <i>Plate XI.</i>) By G. A. Gammie, F.L.S.	171
FURTHER NOTES ON SOME MAMMALS FROM LOWER SIND. By R. C. Wroughton	175

	PAGE
SOME NOTES ON BIRDS FROM GYANTSE AND CHUMBI IN TIBET, WITH A LIST OF THE GAME BIRDS KILLED DURING THE FOUR YEARS, 1906-1909. By Captain F. M. Bailey	178
THE IMPROVEMENT IN THE YIELD AND QUALITY OF INDIAN WHEAT. By Albert Howard, M.A., A.R.C.S., F.L.S., Im- perial Economic Botanist, and Gabrielle L. C. Howard, M.A., Associate and some time Fellow of Newnham College, Personal Assistant to the Imperial Economic Botanist	187
A NEW SNAKE FROM THE WESTERN HIMALAYAS <i>Trachis- chium quinquelabialis</i> . (With a Text-fig.) By Major F. Wall, I.M.S., C.M.Z.S.....	201
PLANTS OF THE PUNJAB. A Brief Descriptive Key to the Flora of the Punjab, North-West Frontier Province and Kashmir. Part IX. By Colonel C. J. Bamber, F.L.S., Indian Medical Service.....	203
THE PROGRESS OF THE MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.....	229
MISCELLANEOUS NOTES.—	
I. Tiger calling like a Sambur. By Major H. H. Harington and J. W. Best, I.F.S.	235
II. Young Tiger attacking Human beings. By H. E. Cross	236
III. Panther and Wild Boar. By Lieut. F. Fitz- Gibbon	237
IV. Golden Cat (<i>Felis temmincki</i>) killing Buffalo Calf. By N. B. Kinnear	237
V. Mongooses in the Eastern Ghats. By P. Roscoe Allen.....	237
VI. Distribution of the Sloth-Bear (<i>Melursus ursinus</i>), and the Indian Lion (<i>Felis leo</i>). By R. Khengarji	238

	PAGE
VII. The Birth of a Wild Elephant Calf. By C. W. Allan, D.F.O.	239
VIII. Notes on the Gaur (<i>Bos gaurus</i>). By Ayl- mer F. Martin	241
IX. The Domestic Breeds of Indian Sheep. By H. J. Elwes.....	245
X. Weight and Measurements of a Serow. By Alex M. Primrose	246
XI. Weight and Measurements of a Goral. By Alex M. Primrose	247
XII. Strange Mortality amongst Black Buck (<i>Antelope cervicapra</i>). By Lt.-Col. G. H. Evans	247
XIII. Large Heads of Malay Sambar and Brow Antlered Deer. By H. J. Davis, F.G.S....	248
XIV. Crow and its Food. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	248
XV. Notes relating to the Habits and Nidifica- tion of the Black-headed Sibia (<i>Lioptila</i> <i>capistrata</i> , Vigors). (With 2 Text-figs.). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ...	249
XVI. A New Bar-wing from Burma. By Major H. H. Harington.....	256
XVII. Curious behaviour of a Myna. By Lieut. F. B. Scott	256
XVIII. Notes on Birds round Rawal Pindi. By H. Whistler, Indian Police, and N. B. Kinnear	256
XIX. Notes on the Nidification of <i>Microcichla scou-</i> <i>leri</i> (Vigors), the little Forktail. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.....	257
XX. Nesting Notes from Lower Burma. By S. M. Robinson.....	261

	PAGE
XXI. Some winter visitors to Rawal Pindi. By H. Whistler, Indian Police.....	262
XXII. Seasonal movements of the Himalayan Greenfinch (<i>Hypacanthis spinoides</i>). By Capt. R. B. Skinner, R.E.....	262
XXIII. Occurrence of <i>Hemilophus pulverulentus</i> , (Temm.) The Great Slaty Woodpecker, in the neighbourhood of Simla, N.-W. Hima- layas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	263
XXIV. Hornbills devouring young Paroquets. By Lt.-Col. A. Newnham, I.A.	263
XXV. Jack Snipe in the Cawnpore District. By Capt. W. B. Spalding, R.A.....	264
XXVI. Nesting of the Cinereous Vulture (<i>Vultur monachus</i>) near Quetta. By Major T. E. Marshall	264
XXVII. Uncommon Birds in Burma. By J. P. Cook	265
XXVIII. Falcon and Gulls. By Lt.-Col. S. E. Prall, I.M.S.	267
XXIX. Nesting of the Osprey or Sea-Hawk. By Lt.-Col. S. E. Prall, I.M.S.....	268
XXX. European Great Bustard in Chitral. By N. B. Kinnear	268
XXXI. Woodcock in Kulu. By J. Coldstream, I.C.S.	269
XXXII. Occurrence of Swinhoe's Snipe (<i>Gallinago megala</i>) at Myitkyina, Upper Burma. By Capt. F. E. W. Venning	269
XXXIII. Occurrence of the Fantail Snipe (<i>Gallinago celestis</i>) in Siam. By D. O. Witt, I.F.S., and W. J. F. Williamson.....	

	PAGE
XXXIV. Snipe Shooting in Upper Burma. By E. N. Bell	271
XXXV. The Occurrence of a "Booby," <i>Sula cyanops</i> (?) at Cannanore. By Major H. R. Baker	272
XXXVI. The Occurrence of <i>Cygnus bewicki</i> and other Swans in India. By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.....	273
XXXVII. Uncommon Birds in the United Provinces. By Capt. M. A. Girdlestone, 41st Dogras.	274
XXXVIII. Nidification of the Little Grebe or Dabchick (<i>Podiceps albipennis</i>). By John Fry.....	275
XXXIX. Recovery of Birds from Injuries. (<i>With a Text-fig.</i>) By Lt.-Col. G. H. Evans	276
XL. Habits of the Python (<i>Python molurus</i>). By W. Forsyth	277
XLI. Remarks on Two rare Blind Snakes. (<i>With a Text-fig.</i>) By Major F. Wall, I.M.S., C.M.Z.S.	278
XLII. On the Occurrence of the Snake <i>Dipsadomorphus nuchalis</i> (Beddome) in Berhampur, Orissa. By Major F. Wall, I.M.S., C.M.Z.S..	279
XLIII. Is <i>Lycodon gammiei</i> (Blanford) an aberrant specimen of <i>Lycodon fasciatus</i> (Anderson)? By Major F. Wall, I.M.S., C.M.Z.S.	279
XLIV. Do Snakes swallow stones? By E. A. D'Abreu, F.Z.S.....	281
XLV. Remarks on the Greater and Lesser Black Kraits (<i>Bungarus niger</i> and <i>B. lividus</i>). By Major F. Wall, I.M.S., C.M.Z.S.	281
XLVI. Large Common and Banded Kraits. By Major O. A. Smith, 27th Punjabis	283

	PAGE
XLVII. The Development of Embryo in the Eggs of the Oviparous Viper, <i>Lachesis monticola</i> , prior to oviposition. By Major F. Wall, I.M.S., C.M.Z.S.	284
XLVIII. A Sporting Kashmir Fish, the Cheroo, <i>Schizothorax esocinus</i> . By F. J. Mitchell	285
XLIX. Note on Distribution of <i>Lethe kansa</i> (Moore) and <i>Dophla patala</i> (Kollar). By F. Hannington	286
L. Appeal for information concerning <i>Papilio polytes</i> . By J. C. F. Fryer	287
LI. A Note on <i>Polyommatus beticus</i> . By Capt. F. C. Fraser, I.M.S.	287
LII. Some disputed points in the Anatomy of a common Indian Earthworm. (<i>With 3 Text-figs.</i>) By Capt. R. E. Lloyd, I.M.S., and A. Powell	289
LIII. A Natural Bird-lime. By C. Gilbert Rogers.	293
LIV. Natural Selection. By C. E. C. Fischer, I.F.S.	294
LV. Immunity of Animals to Snake-bite. By Capt. A. H. Mosse, I.A.	295
LVI. Natural History Notes from the Red Sea. By F. Hannington, I.C.S.	299
PROCEEDINGS	300

No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VI. (<i>With Plates V, VI, and A.</i>) By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.	302
SOME NEW INDIAN RODENTS. (<i>With a Plate and 2 Text-figs.</i>) By R. C. Wroughton, F.Z.S.	338
THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part VI. (<i>With Plates. XXVI—XXXII, and Text-figs. 20-23.</i>) By E. Blatter, S.J.	343

	PAGE
BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S.	392
THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part III. By Sir George F. Hampson, Bart., F.Z.S., F.E.S.	411
A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVII. (<i>With Plate XVII.</i>) By Major F. Wall, I.M.S., C.M.Z.S.	447
A MONOGRAPH OF THE WASPS OF THE GENUS <i>Cerceris</i> INHABITING BRITISH INDIA. With Notes on other Asiatic Species. (<i>With Plates A. and B.</i>) By Rowland E. Turner, F.Z.S., F.E.S.	476
THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (Including those met with in the Hill Stations of the Bombay Presidency). Part X. (<i>With Plates D2, D3, D4.</i>) By T. R. Bell, I.F.S.	517
BIRD NOTES BY THE WAY IN KASHMIR. (<i>With 2 Text-figs.</i>) By Major H. A. F. Magrath	545
A LIST OF INDIAN BUTTERFLIES. By Capt. W. H. Evans, R.E.	553
SOME MAYMYO BIRDS. Part II. By Major H. H. Harington.....	585
NOTES ON BUTTERFLIES FROM THE NAGA HILLS. Part II. (<i>With Plate B.</i>) By Major H. C. Tytler, 17th Infantry	588
NOTES ON FLATA. (<i>With Plates A. & B.</i>) By J. C. Kershaw, F.Z.S., F.E.S.....	607
THE OOTHECA OF AN ASILID. (<i>With Plates A. & B.</i>) By J. Kershaw, F.Z.S., F.E.S.	610
RAMBLING NOTES ON NATURAL HISTORY IN CHITRAL. (<i>With 2 Text-figs.</i>) By Major F. Wall, I.M.S., C.M.Z.S.	614
SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS. By Capt. F. E. W. Venning	621

	PAGE
A NEW SNAKE, <i>Psammophis triticeus</i> , FROM BALUCHISTAN. (With 2 Text-figs.) By Major F. Wall, I.M.S., C.M.Z.S..	634
DESCRIPTION OF A NEW SPECIES OF <i>Acmaea</i> FROM BOMBAY, AND NOTES ON OTHER FORMS FROM THAT LOCALITY. (With a Text-fig.) By Edgar A. Smith, I.S.O.	637
PROGRESS OF THE MAMMAL SURVEY. (With a Plate and a Map)	640
REVIEWS. "Forty years among the Wild Animals of India." By F. C. Hicks, and "Medical Entomology." By A. Alcock	645
OBITUARY NOTICE. E. W. Oates	651
MISCELLANEOUS NOTES :—	
I. The number of Cubs in a Tiger's litter. By Lt. C. R. S. Pitman, 27th Punjabis	653
II. The Stoat in Kashmir. By Major H. A. F. Magrath	653
III. A Deformed Thamin Stag (<i>Cervus eldii</i>). (With a Text-fig.) By A. H. D. Barron, 17th Infantry	654
IV. Do Chinkara (<i>Gazella bennetti</i>) drink water ? By Lt. C. R. S. Pitman, 27th Punjabis ...	655
V. Indian Breeds of Sheep. By H. J. Elwes.	655
VI. The Banting or Tsaing (<i>Bos sondaicus</i>). (With a Text-fig.) By A. Rodgers	656
VII. The Colouration of Tigers. By Lt. C. R. S. Pitman, 27th Punjabis	657
VIII. A Deformed Head of the Four-horned Ante- lope. By C. R. S. Pitman, 27th Punja- bis.....	658
IX. The Pintail Duck (<i>Dafila acuta</i>) shot in September. By Major H. A. F. Magrath.	658

	PAGE
X. Occurrence of European Striated Swallow (<i>Hirundo rufula</i>) in Kangra. By H. Whistler, Indian Police	659
XI. Nidification of the Tweeddale Scimitar Bab-bler (<i>Pomatorhinus nuchalis</i>). By J. P. Cook.....	659
XII. The Paradise Flycatcher (<i>Terpsiphone para-disi</i>). By Major H. A. F. Magrath	660
XIII. The Crag Martin (<i>Ptyonoprogne rupestris</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ...	660
XIV. Extension of the Habitat of the Common Kingfisher (<i>Alcedo ispida</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	661
XV. Note on the Common Kingfisher (<i>Alcedo ispida</i>). By Major H. A. F. Magrath ...	661
XVI. The Notes of Pallas's Fishing-Eagle (<i>Haliaëtus leucoryphus</i>) and some water birds. By Major H. A. F. Magrath	662
XVII. Immature Plumage of Lammergeyzer (<i>Gypaëtus barbatus</i>). By H. Whistler, I.P.	663
XVIII. Occurrence of the Goshawk (<i>Astur palum-barius</i>) in Sind. By Raymond W. Cooper	665
XIX. Extension of the Habitat of the Brahminy Kite (<i>Haliastur indus</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	665
XX. The Painted Snipe (<i>Rostratula capensis</i>). By Lt. C. R. S. Pitman, 27th Punjabis...	666
XXI. Painted Snipe (<i>Rostratula capensis</i>) in large numbers. By A. H. Kingston	667
XXII. Record of Snipe Shot at Hminelongyee, in the Chiengmai District of Siam, 18°15' North Lat., 98° East Long., from 1905 to 1910. By D. L. Keddie.....	667

	PAGE
XXIII. Notes on some of the Bird Life at Thandoung. By J. P. Cook	668
XXIV. Migration of Baya (<i>Ploceus baya</i>). By A. B. Punde, D.F.O.	675
XXV. The Maroon Oriole (<i>Oriolus traillii</i>). By Alex. M. Primrose	676
XXVI. Wood Snipe (<i>Gallinago nemoricola</i>) occurring near Bangalore. By Lieut.-Col. R. M. Betham, 10th Grenadiers.....	677
XXVII. Goose-shooting in Cutch. By Maharaj Ku- mar Shri Vijayarajji.....	678
XXVIII. Falcons and their prey. By Lt.-Col. S. E. Prall, I.M.S.	680
XXIX. On the Occurrence of the Common Wood Shrike (<i>Tephrodornis pondicerianus</i>) and the Central Asian Black-bird (<i>Merula maxima</i>) near Peshawar. By H. A. F. Magrath, 51st Sikhs, F. F.	680
XXX. Habits, Food and Nesting of the Great Hi- malayan Barbet (<i>Megalæma marshallorum</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U. ...	681
XXXI. Marbled Duck at Baroda. By Lt.-Col. R. G. Burton, 94th Russell's Infantry	684
XXXII. The Sooty Tern (<i>Sterna fuliginosa</i>) in Cachar. By E. C. Stuart Baker, F.Z.S., F.L.S.	684
XXXIII. Notes on the Southern Migration of Snipe near Calcutta, 1911. By C. R. S. Pitman, 27th Punjabis	684
XXXIV. Occurrence of the Nukhta or Comb-duck (<i>Sarcidiornis melanonota</i>) in Sind. By M. Webb, I.C.S.	685
XXXV. The Breeding of the False Himalayan Viper (<i>Psammodynastes pulverulentus</i>). By Major F. Wall, I.M.S., C.M.Z.S.....	686

XXXVI.	Food of the snake <i>Rhabdops bicolor</i> . By Major F. Wall, I.M.S., C.M.Z.S.	686
XXXVII.	The Diet of the Bull-Frog (<i>Rana tigrina</i>). By S. P. Agharkar	687
XXXVIII.	Notes on the Indian Chamæleon (<i>Chamæleon calcaratus</i>). By C. Chenevix Trench, I.C.S.	687
XXXIX.	Snake eating a Snipe. By Capt. F. E. W. Venning	689
XL.	Some Notes on the Hatching of the Agamoid Lizard (<i>Calotes jerdoni</i>). (With a Text-fig.) By Capt. F. E. W. Venning	690
XLI.	Breeding of Maclelland's Coral Snake (<i>Callophis maclellandi</i>). By Major F. Wall, I.M.S., C.M.Z.S.....	693
XLII.	The Madras Aquarium. By N. Annandale.	693
XLIII.	The Life of a Dog Tick. By Capt. W. J. Massy, 12th Pioneers	694
XLIV.	Asilid Oviposition. (With a Text-fig.). By S. K. Sen, Asst. to 2nd Imp. Ent.	695
XLV.	Caterpillar Pest on Cotton in Khandesh. By R. S. Kasargode, Lecturer on Entomology, Poona Agricultural College	698
XLVI.	Note on the Butterflies <i>Lethe kansa</i> and <i>Dophla patala</i> . By G. W. V. DeRhè-Philipe, F.E.S.	698
XLVII.	<i>Papilio polytes</i> in Bangalore. By K. Kunhi Kannan, Asst. to State Mycologist and Entomologist	699
XLVIII.	A Note on <i>Trichosanthes dioica</i> , Roxb. By Lt.-Col. K. R. Kirtikar, I.M.S. (Ret.)	700
XLIX.	Notes on the Flora of the Vale of Kashmir. By J. H. A. Ivens	701

	PAGE
L. Second Year's growth of a Plantain Inflorescence. (<i>With a Text-fig.</i>). By W. Burns, Economic Botanist, Poona.	706
LI. A Fly Trap (<i>Boucerosia crenulata</i> , Wight and Arn.). By Capt. F. E. W. Venning	707
LII. Note on <i>Macrochlamys</i> (<i>Eurychlamys</i>) <i>platychlamys</i> (Blanford), etc. By A. J. Peile.	707
LIII. Conchological Notes from Bombay. By Lionel E. Adams, B.A.	708
LIV. Notes on the Cutch Ammonites. (<i>With a Map and 2 Diagrams</i>). By J. H. Smith..	709
PROCEEDINGS.....	716

No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VII. (<i>With Plates VII and A. & B.</i>). By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.	721
THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA. (Including those met with in the Hill Stations of the Bombay Presidency). Part XI. (<i>With 2 Text-figs.</i>). By T. R. Bell, I.F.S.	740
SOME NEW INDIAN MAMMALS. (<i>With a Text-fig.</i>). By R. C. Wroughton	767
TERMITES FROM BRITISH INDIA (Bombay) COLLECTED BY DR. J. ASSMUTH, S.J. (<i>With Plates A-D</i>). By Nils Holmgren (Stockholm)	774
A MONOGRAPH OF THE WASPS OF THE GENUS <i>Cerceris</i> INHABITING BRITISH INDIA. With Notes on other Asiatic Species. Part II. (<i>With Plates C. & D.</i>). By Rowland E. Turner, F.Z.S., F.E.S.	794
BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S. (<i>With 3 Text-figs.</i>)	820

	PAGE
DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA. - Part XV. By E. Meyrick, B.A., F.R.S., F.Z.S.	852
THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part IV. By Sir George F. Hampson, Bart., F.Z.S., F.E.S.	878
THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part VII. (<i>With Plates XXXIII— XXXIX, and Text-figs. 24—27</i>). By E. Blatter, S.J....	912
A LIST OF INDIAN BUTTERFLIES. Part II. By Capt. W. H. Evans, R.E.	969
A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVIII. (<i>With Plate XVIII, Diagram and Map</i>). By Major F. Wall, I.M.S., C.M.Z.S.	1009
PLANTS OF THE PUNJAB. A Brief Descriptive Key to the Flora of the Punjab, North-West Frontier Province and Kashmir. Part X. By Colonel C. J. Bamber, F.L.S., Indian Medical Service	1022
PROGRESS OF THE MAMMAL SURVEY.....	1060
MISCELLANEOUS NOTES :—	
I. Notes on Tigers. By C. E. C. Fischer, I.F.S., F. Dewar, I.C.S., Lieut.-Colonel R. G. Burton, 94th Russell's Infantry, and Capt. V. A. S. Keighley, Viceroy's Bodyguard..	1062
II. Notes on Panthers. By Lieut.-Colonel R. G. Burton, 94th Russell's Infantry	1063
III. A large Oorial head. (<i>With a Text-fig.</i>) By Colonel H. V. Biggs	1065
IV. The so-called One-horned Sheep of Nepal and other breeds. (<i>With a Plate and a Text- fig.</i>) By Lieut.-Colonel J. Manners-Smith.	1066
V. Some Notes from the Abor Expedition. (<i>With a Text-fig.</i>) By Major Alban Wil- son, 8th Gurkhas.....	1068

	PAGE
VI. Do Chinkara (<i>Gazella bennetti</i>) drink water? By Lt.-Col. R. G. Burton, 94th Russell's Infantry, and F. Dewar, I.C.S.....	1068
VII. Recovery of Animals from Injuries. By W. J. H. Ballantine, Assistant Political Officer, Sadiya	1069
VIII. Note on Takin (<i>Budorcas taxicolor</i>). (<i>With</i> <i>2 Plates</i>). By Capt. F. M. Bailey	1069
IX. Gayal or Mithan (<i>Bibos frontalis</i>). (<i>With a</i> <i>Text-fig.</i>) By Capt. F. M. Bailey	1071
X. Tsine (<i>Bibos sondaicus</i>) found with village cattle. By T. A. Hauxwell, Conservator of Forests, Burma.....	1072
XI. Notes on Birds from Lahore. By A. E. Jones	1073
XII. Nestling Plumage of the Great Stone Plover (<i>Esacus recurvirostris</i>). By H. Whistler, Indian Police	1074
XIII. The Himalayan Greenfinch (<i>Hypacanthis spi-</i> <i>noidis</i> , Vigors). By H. Whistler, Indian Police	1074
XIV. Distribution, Habits, and Nesting of the Himalayan Greenfinch (<i>Hypacanthis spi-</i> <i>noides</i> , Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1075
XV. The Long-tailed Grass Warbler (<i>Laticilla</i> <i>burnesi</i> , Blyth). By H. Whistler, Indian Police	1080
XVI. Nidification of Burmese Great Black Wood- pecker (<i>Thriponax feddeni</i>). By J. P. Cook	1081
XVII. A Kite's Larder. By G. L. Remington. ...	1082

	PAGE
XVIII. Occurrence of the Common Peafowl (<i>Pavo cristatus</i> , Linn.) in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1082
XIX. Swinhoe's Snipe (<i>Gallinago megala</i>) near Madras. By R. F. Stoney, and I. S. Fraser	1083
XX. Cruelty to Wild Fowl, &c., in Sind. By Capt. C. H. Elliot, 58th Rifles, F.F.	1083
XXI. The Himalayan Snow Cock (<i>Tetrogallus himalayensis</i>). (With a Text-fig.) By W. G. Appleford	1084
XXII. Woodcock (<i>Scolopax rusticula</i>) in South Andamans. By Major J. H. Whitehead, 93rd Burma Infantry	1085
XXIII. Note on the Habits of Swinhoe's Reed-Warbler (<i>Urosphena squamiceps</i>) and on the Nesting of the Burmese Great Woodpecker (<i>Triponax feddeni</i>). By J. P. Cook	1085
XXIV. Chinese Grey Duck in Burma. By Major H. H. Harington.....	1086
XXV. Nidification of Davison's Babbler (<i>Turdinulus exsul</i>). By S. M. Robinson.	1088
XXVI. The Sheldrake (<i>Tadorna cornuta</i>) in the United Provinces. By F. B. Scott	1089
XXVII. Notes on some Birds from the Chindwin Valley. By Cyril Hopwood, D. C. Forests	1089
XXVIII. Baikal or Clucking Teal (<i>Nettion formosum</i>) shot in Assam. By Francis W. Gore, and Evan A. Evans.....	1090
XXIX. Insects in the Nest of the Common Swift (<i>Cypselus affinis</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1091

	PAGE
XXX. Distribution of the Cricket <i>Schizodactylus monstruosus</i> . By Lieut. W. P. C. Tenison, R.F.A.	1091
XXXI. Intelligence of Ants. By F. B. Scott.	1092
XXXII. The Castor Rust (? <i>Melampsorella ricini</i> , De Tomi). (With Plates A. & B.). By S. L. Ajrekar, B.A., Assistant Professor of Mycology, Poona.....	1092
XXXIII. Notes on Cacti in North-West India. By R. N. Parker, D. C. Forests.....	1095
XXXIV. A branching Palmyra Palm (<i>Borassus flabel-lifer</i> . (With a Text-fig.). By R. F. Stoney..	1098
XXXV. Rate of growth of a Dhaman (<i>Zamenis mucosus</i>) hatchling. By E. A. D'Abreu, F.Z.S.	1099
XXXVI. The rupture of the Egg-shell in the Genus <i>Calotes</i> . By N. Annandale.....	1099
XXXVII. Chinese Gold Fish (<i>Carassius auratus</i>). By F. H. S. Stone.....	1100
XXXVIII. Horse-Mackerel attacking Jelly Fish. By F. H. S. Stone	1101
PROCEEDINGS.....	1102

No. 4.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part VIII. (With Plate VIII). By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.....	1109
ORCHIDS OF THE BOMBAY PRESIDENCY. Part XIII. By G. A. Gammie, F.L.S.	1129
THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY). Part XII. (With Plates 1 & J., and Text-figs. 15-22). By T. R. Bell, I.F.S. ...	1131

	PAGE
NOTES ON A BIRD COLLECTING TRIP IN THE BALAGHAT DISTRICT OF THE CENTRAL PROVINCES. By E. A. D'Abreu, F.Z.S.....	1158
BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA. Report by R. C. Wroughton, F.Z.S. (<i>With a Plate and 2 Text-figs.</i>)	1170
A LIST OF BIRDS FROM ARAKAN. By Cyril Hopwood, I.F.S..	1196
THE MOTHS OF INDIA. Supplementary Paper to the volumes in "The Fauna of British India." Series IV, Part V. (<i>With Plate G.</i>). By Sir George F. Hampson, Bart., F.Z.S., F.E.S.	1222
THE FUNGI OF INDIA. Part I. (<i>With Plates I—IV., and Text-figs. 1-10.</i>). By F. Theissen, S.J.	1273
MORE BIRD NOTES BY THE WAY IN KASHMIR. (<i>With 2 Text-figs.</i>). By Lt.-Col. H. A. F. Magrath	1304
PROGRESS OF THE MAMMAL SURVEY	1315
MISCELLANEOUS NOTES :—	
I. Tiger (<i>Felis tigris</i>) killing and eating its young. By James W. Best, I.F.S.	1318
II. Cannibalism among Panthers (<i>Felis pardus</i>). By Major J. R. Carter, Bombay Political Department	1319
III. Number of a Panther's (<i>Felis pardus</i>) caudal vertebræ. By Captain A. H. Mosse, I.A	1319
IV. Notes on Martens in Kashmir. By Lt.-Col. H. A. F. Magrath	1320
V. Notes on the Time of Appearance and Flight of Eastern Bats. By G. C. Shortridge ...	1321
VI. The Habits of Voles. (<i>With a Diagram</i>). By Lt.-Col. H. A. F. Magrath	1322
VII. The Indian Buffalo (<i>Bubalus bubalis</i>). By G. C. Shortridge	1323

	PAGE
VIII. Tsine (<i>Bibos sondaicus</i>) consorting with tame cattle. By Major G. P. Evans, XIX Punjabis	1323
IX. Habits of the Kashmir Stag (<i>Cervus kashmiriensis</i>) in summer. By Lt.-Col. H. A. F. Magrath	1325
X. Abnormal type (?) of Eggs of the Little Forktail (<i>Microcichla scouleri</i> , Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.....	1327
XI. Nesting of the Western Blue Rock Thrush (<i>Petrophila cyanus</i> , Linn.) in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1328
XII. The Himalayan Greenfinch (<i>Hypacanthis spinoides</i>). By Lt.-Col. H. A. F. Magrath	1329
XIII. Early arrival of Grey Wagtail. By J. Donald, I.F.S.	1329
XIV. Eggs of the Large Hawk-Cuckoo (<i>Hierococcyx sparveroides</i>). By A. E. Osmaston	1330
XV. Question whether <i>Gyps fulvus</i> , Gmelin, the Griffon, occurs in the Himalayan districts of the Punjab. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1331
XVI. A Kite's larder. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1332
XVII. Tameness of Great Indian Bustard (<i>Eupodotis edwardsi</i>). By R. Teague Jones, Indian Police	1333
XVIII. Bustard in Kathiawar. By Major J. R. Carter, Bombay Political Department.....	1333
XIX. The Great Indian Bustard (<i>Eupodotis edwardsi</i>). By A. B. Aitken	1334

	PAGE
XX. The Masked Booby (<i>Sula cyanops</i>) in Bombay Harbour. By N. B. Kinnear	1334
XXI. Baikal or Clucking Teal (<i>Nettion formosum</i>). By A. B. Aitken	1335
XXII. Is <i>Lycodon gammiei</i> (Blanford) an aberrant specimen of <i>Lycodon fasciatus</i> (Anderson)? (With a Text-fig.). By E. A. D'Abreu, F.Z.S.	1335
XXIII. Notes on the size and breeding of the common Green Whip-snake (<i>Dryophis mycterizans</i>). By N. B. Kinnear	1336
XXIV. Cobra breeding at Parel. By Surgeon-General W. B. Bannerman, I.M.S., and Senior Assistant Surgeon J. P. Pocha, L.M. & S.	1337
XXV. Breeding of the Common Green Viper (<i>Lachesis gramineus</i>). By N. B. Kinnear.	1339
XXVI. Saw-Scaled Viper (<i>Echis carinata</i>) as a tree snake. By Capt. A. H. E. Mosse, I.A. ...	1339
XXVII. Habitat of <i>Echis carinata</i> . By Capt. G. G. Jolly, I.M.S.	1340
XXVIII. "Poisonous" Lizards in India. By H. F. Saunders	1341
XXIX. The Food of a Bull-frog (<i>Rana tigrina</i>). By J. P. Mullan, M.A.	1341
XXX. Vitality of a Butterfly. By Capt. G. A. Hassels-Yates, R.G.A.	1342
XXXI. The Bed Bug (<i>Cimex rotundatus</i>) on the Common Yellow Bat (<i>Scotophilus kuhli</i>). By K. Kunhikannan, M.A., F.E.S., Assistant Entomologist, Bangalore	1342
XXXII. Flies on Snow. By Lt.-Col. H. A. F. Magrath	1342

	PAGE
XXXIII. Preservation of Game. (<i>With a Text-fig.</i>). By St. G. de Carteret	1343
XXXIV. Notes on Cutch Ammonites. II. (<i>With 2 Diagrams</i>). By J. H. Smith	1347
XXXV. Ammonites from Cutch. By H. J. Davies, F.G.S.	1352
XXXVI. The Trinomial System of Nomenclature. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	1354
XXXVII. Letter from Mr. A. D. Younghusband, C.S.I., I.C.S., Commissioner in Sind, on Cruelty to Wild Fowl in Sind	1356
PROCEEDINGS	1358

ALPHABETICAL LIST OF CONTRIBUTORS.

VOLUME XXI.

	PAGE		PAGE
ADAMS, LIONEL E., B.A. ; Con- chological Notes from Bom- bay	708	BAILEY, Captain F. M. ; Notes on Takin (<i>Budorcas taxicolor</i>). (With 2 Plates.)	1069
AGHARKAR, S. P. ; The Diet of the Bull-Frog (<i>Rana tigrina</i>). ..	687	————— ; Gayal or Mithan (<i>Bibos frontalis</i>). (With a Text-fig.)	1071
AITKEN, A. B. ; The Great Indian Bustard (<i>Eupodotis edwardsi</i>)	1334	BAKER, E. C. STUART, F.L.S., F.Z.S., M.B.O.U. ; The Game Birds of India, Burma and Ceylon. Part V	20
————— ; Baikal or Clucking Teal (<i>Nettion for- mosum</i>)	1335	————— ; The Occurrence of <i>Cygnus bewicki</i> and other Swans in India.. .. .	273
AJREKAR, S. L., B.A., Assis- tant Professor of Mycology, Poona ; The Castor Rust (<i>Melampsorella ricini</i> , De Tomi). (With Pls. A. & B.)	1092	————— ; The Game Birds of India, Burma and Ceylon. Part VI. (With Pls. V, VI, and A.)	302
ALLEN, C. W., D. F. O. ; The Birth of a Wild Elephant Calf	239	————— ; The Sooty Tern (<i>Sterna fuliginosa</i>) in Cachar	684
ALLEN, P. ROSCOE ; Mungoses in the Eastern Ghats	237	————— ; The Game Birds of India, Burma and Ceylon. Part VII. (With Pls. VII., and A., and B.)	721
ANNANDALE, N. ; The Madras Aquarium	693	————— ; The Game Birds of India, Burma and Ceylon. Part VIII. (With Pl. VIII.) ..	1109
————— ; The rupture of the Egg-shell in the Genus <i>Calotes</i>	1099	BAKER, Major H. R. ; The Oc- currence of the "Booby," <i>Sula cyanops</i> (P) at Cannan- nore	272
APPLEFORD, W. G. ; The Hi- malayan Snow Cock (<i>Tetro- gallus himalayensis</i>). (With a Text-fig.)	1084	BALLANTINE, W. J. H., Assist- ant Political Officer, Sadiya ; Recovery of Animals from Injuries	1069
BAILEY, Captain F. M. ; Some Notes on Birds from Gyantse and Chumbi in Tibet, with a List of the Game Birds killed during the four years, 1906-1909	178		

	PAGE		PAGE
BAMBER, Colonel C. J., F.L.S., Indian Medical Service; Plants of the Punjab. A Brief Descriptive Key to the Flora of the Punjab, North- West Frontier Province and Kashmir. Part IX ..	203	BEST, JAMES W., I. F.S.; Tiger calling like a Sambar ..	235
Plants of the Punjab. A Brief Descriptive Key to the Flora of the Punjab, North- West Frontier Province and Kashmir. Part X ..	1022	—————; Tiger (<i>Felis tigris</i>) killing and eating its young ..	1318
BANNERMAN, Surgeon-General W. B., and POCHA, Senior Assistant Surgeon, J.P., L.M. & S.; Cobra breeding in Parel ..	1337	BETHAM, Lieut.-Col. R. M., 10th Grenadiers; Wood Snipe (<i>Gallinago nemoricola</i>) occurring at Bangalore ..	677
BARRON, A. H. D., 17th Infan- try; A Deformed Thamin Stag (<i>Cervus eldi</i>). (<i>With a Text-fig.</i>) ..	854	BIGGS, Colonel H. V.; A Large Oorial head. (<i>With a Text- fig.</i>) ..	1065
BELL, E. N.; Snipe Shooting in Upper Burma ..	271	BLATTER, E., S. J.; The Palms of British India and Ceylon, Indigenous and Introduced Part V. (<i>With Pls. XVIII- XXV and Text-figs. 13-19</i>) ..	66
BELL, T. R., I. F. S.; The Common Butterflies of the Plains of India (Including those met with in the Hill Stations of the Bombay Presidency). Part X. (<i>With Pls. D 2, D 3 and D 4</i>) ..	517	—————; A List of Indian Fungi, chiefly of the Bombay Presidency, with the Description of Two New Species. (<i>With a Plate</i>). ..	146
—————; The Common Butterflies of the Plains of India (including those met with in the Hill Stations of the Bombay Presidency). Part XI. (<i>With 2 Text-figs.</i>) ..	740	—————; The Palms of British India and Ceylon, Indigenous and Introduced. Part VI. (<i>With Pls. XXVI- XXXII and Text-figs. 20-23</i>) ..	343
—————; The Common Butterflies of the Plains of India (including those met with in the Hill Stations of the Bombay Presidency). Part XII. (<i>With Pls. I. and J. and Text-figs. 15-22</i>) ..	1131	—————; The Palms of British India and Ceylon, Indigenous and Introduced. Part VII. (<i>With Pls. XXXIII-XXXIX and Text- figs. 24-27.</i>) ..	912
		BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA; Progress of— ..	229
		—————; Report by R. C. Wroughton, F.Z.S. ..	392
		—————; Progress of—(<i>With a Plate and a Map</i>) ..	640
		—————; Report by R. C. Wroughton, F.Z.S. (<i>With 3 Text-figs.</i>) ..	820

	PAGE		PAGE
BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA; Progress of— ..	1060	<i>ceps</i>) and on the nesting of the Burmese Great Woodpecker (<i>Thriponax feddeni</i>)..	1085
Report by R. C. Wroughton, F.Z.S. (<i>With a Plate and 2 Text-figs.</i>)	1170	COOPER, RAYMOND W.; Occurrence of the Goshawk (<i>Astur palumbarius</i>) in Sind ..	665
Progress of—	1315	CROSS, H. E.; Young Tiger attacking human beings ..	236
BURNS, W., Economic Botanist, Poona; Second year's growth of a Plantain Inflorescence. (<i>With a Text-fig.</i>) ..	706	D'ABREU, E. A., F.Z.S.; Do snakes swallow stones? ..	281
BURTON, Lt.-Col. R. G., 94th Russell's Infantry; Marbled Duck at Baroda	684	of growth of a Dhaman (<i>Zamenis mucosus</i>) hatchling ..	1099
on Tigers	1062	Notes on a Bird collecting trip in the Balaghat District of the Central Provinces	1158
on Panthers.. ..	1063	Is <i>Lycodon gammiei</i> (Blanford), an aberrant specimen of <i>Lycodon fasciatus</i> (Anderson) (<i>With a Text-fig.</i>)	1335
Chinkara (<i>Gazella bennetti</i>) drink water?	1068	DAVIS, H. J., F.G.S.; Large heads of Malay Sambar and Brow Antlered Deer ..	248
CARTER, Major J. R., Bombay Political Department; Cannibalism among Panthers (<i>Felis pardus</i>)	1319	Ammonites from Cutch	1352
in Kathiawar	1333	DE CARTERET, St. G.: Preservation of Game. (<i>With a Text-fig.</i>)	1343
COLDSTREAM, J., I.C.S.; Woodcock in Kulu	269	DE RHE-PHILIPPE, G. W. V., F.E.S.; Note on the Butterflies <i>Lethe kansa</i> and <i>Dophla patala</i>	698
COOK, J. P.; Uncommon Birds in Burma	265	DEWAR, F., I.C.S.; Notes on Tigers	1062
Nidification of the Tweeddale Scimitar Babbler (<i>Pomatorhinus nuchalis</i>) ..	659	Do Chinkara (<i>Gazella bennetti</i>) drink water?	1069
Notes on some of the Bird Life at Thandoung ..	668	DODSWORTH, P. T. L., F.Z.S., M.B.O.U.; Crow and its food	248
Nidification of Burmese Great Black Woodpecker (<i>Thriponax feddeni</i>)..	1081	Notes relating to the Habits	
Notes on the Habits of Swinhoe's Red Warbler (<i>Urosphenax squami-</i>			

	PAGE		PAGE
and Nidification of the Black-headed Sibia, <i>Lioptila</i> <i>capistrata</i> (Vigors). (<i>With 2</i> <i>Text-figs.</i>)	249	DODSWORTH, P. T. L., F.Z.S., M.B.O.U.; Abnormal type ^(P) of Eggs of the Little Forktail (<i>Microcichla</i> <i>scouleri</i> , Vigors)	1327
Dodsworth, P. T. L., F. Z. S., M. B. O. U. Notes on the Nidification of <i>Microcichla</i> <i>scouleri</i> (Vigors), The Little Forktail	257	;	
Occurrence of <i>Hemilophus</i> <i>pulverulentus</i> : (Temm.) The Great Slaty Woodpecker in the neighbourhood of Simla, N.-W. Himalayas	263	Nesting of the Western Blue Rock Thrush (<i>Petropila</i> <i>cya-</i> <i>nus</i> , Linn.) in the neighbou- hood of Simla, N.-W. Hi- malayas	1328
;		;	
The Crag Martin (<i>Ptyono-</i> <i>progne rupestris</i>)	660	Question whether <i>Gyps</i> <i>fulvus</i> , Gmelin, the Griffon, occurs in the Himalayan districts of the Punjab	1331
;		;	
Extension of the Habitat of the Common Kingfisher (<i>Alcedo isipida</i>)	661	A Kite's larder	1332
;		;	
Extension of the Habitat of the Brahminy Kite (<i>Halias-</i> <i>tur indus</i>)	665	The Trinomial System of nomenclature	1354
;		DONALD, J., I. F. S.; Early arrival of Grey Wagtail	1329
Habits, Food and Nesting of the Great Himalayan Barbet (<i>Megalæma marshallorum</i>)	681	ELLIOT, CAPT. C. H., 58th Rifles, F. F.; Cruelty to Wild Fowl, &c., in Sind	1083
;		ELWES, H. J.; The Domestic Breeds of Indian Sheep	245
Distribution, Habits, and Nesting of the Himalayan Greenfinch (<i>Hypacanthis</i> <i>spinoides</i> , Vigors)	1075	—————; Indian Breeds of Sheep	655
;		EVANS, EVAN A.; Baikal or Clucking Teal (<i>Nettion for-</i> <i>mosum</i>) shot in Assam	1091
Occurrence of the Common Peafowl (<i>Pavo cristatus</i> , Linn.) in the neighbourhood of Simla, N.-W. Himalayas .	1082	EVANS, Lieut.-Colonel G. H.; Strange mortality amongst Black Buck (<i>Antelope cervi-</i> <i>capra</i>)	247
;		;	
Insects in the nest of the Common Swift (<i>Cypselus</i> <i>affinis</i>)	1091	Recovery of Birds from In- juries. (<i>With a Text-fig.</i>)..	276
		EVANS, Major G. P., XIX Punjabis; Tsine (<i>Bibos son-</i> <i>daicus</i>) consorting with tame cattle.. .. .	1323

	PAGE		PAGE
EVANS, Capt. W. H., R. E. ; A List of Indian Butterflies.	553	mentary Paper to the volumes in "The Fauna of British India," Series IV, Part III	411
----- ; A List of Indian Butterflies Part II	969	----- ; The Moths of India. Supple- mentary Paper to the volumes in "The Fauna of British India," Series IV, Part IV	878
FAWCETT, Col. J. M. ; Mimicry in Silk-Worm Moths	xxxix	----- ; The Moths of India. Sup- plementary Paper to the volumes in "The Fauna of British India", Series IV, Part V. (<i>With Pl. G</i>)	1222
FISCHER, C. E. C., I. F. S. ; Notes on Tigers	1062	HANNYNGTON, F., I.C.S. ; Note on Distribution of <i>Lethe</i> <i>kansa</i> (Moore) and <i>Dophla</i> <i>patala</i> , Kollar	286
----- ; Natural Selection	294	----- ; Na- tural History notes from the Red Sea	299
FITZ-GIBBON, Lieut. F. ; Pan- ther and Wild Boar	237	HARRINGTON, Major H. H. ; Tiger calling like a Sambur.	235
FORSYTH, W. ; Habits of the <i>Python (Python molurus)</i>	277	----- ; A new Bar-wing from Burma	256
FRASER, Capt. F. C., I. M. S. ; A note on <i>Polyommatus beti-</i> <i>cus</i>	287	----- ; Some Maymyo Birds. Part II	585
FRASER, I. S. ; Swinhoe's Snipe (<i>Gallinago megala</i>) near Mad- ras	1083	----- ; Chinese Grey Duck in Burma	1086
FRY, JOHN ; Nidification of the Little Grebe or Dabchick (<i>Podiceps albipennis</i>)	275	HASSELS-YATES, Capt. G. A., R. G. A. ; Vitality of a Butterfly	1342
FRYER, J. C. F. ; Appeal for information concerning <i>Pap-</i> <i>ilio polytes</i>	287	HAUXWELL, T. A., Conserva- tor of Forests, Burma. Tsine (<i>Bibos sondaicus</i>) found with village cattle	1072
GAMMIE, G. A., F. L. S. ; Orchids of the Bombay Pre- sidency. Part XII. (<i>With</i> <i>Pl. XI</i>)	171	HOLMGREN, NILS (Stock- holm) ; Termites from Bri- tish India (Bombay) collect- ed by Dr. J. Assmuth, S.J. (<i>With Pls. A-D</i>).	774
----- ; Orchids of the Bombay Pre- sidency. Part XIII	1129		
GIRDLESTONE, Capt. M. A., 41st Dogras ; Uncommon Birds in the United Provinces	274		
GORE, FRANCIS W. ; Baikal or Clucking Teal (<i>Nettion for-</i> <i>mosum</i>) shot in Assam	1090		
HAMPSON, Sir GEORGE F., Bart., F.Z.S., F.E.S. ; The Moths of India. Supple-			

	PAGE		PAGE
HOPWOOD, CYRIL. D. C.		Lat., 98° East Long., from	
Forests; Notes on some		1905 to 1910	667
Birds from the Chindwin		KEIGHLEY, Capt. V. A. S.,	
Valley	1089	Viceroy's Bodyguard; Notes	
-----;		on Tigers	1063
A List of Birds from Ara-		KERSHAW, J.C., F.Z.S., F.E.S.;	
kan.. ..	1196	Notes on Flata. (<i>With Pls.</i>	
HOWARD, ALBERT, M.A.,		<i>A. & B.</i>)	607
A.R.C.S., F.L.S., Imperial		-----;	
Economic Botanist, and		The Ootheca of an Asilid.	
HOWARD, GABRIELLE, L.C.,		(<i>With Pls. A. & B.</i>).. ..	610
M.A., Associate and some		KHENGARJI, R.; Distribution	
time Fellow of Newnham		of the Sloth-Bear (<i>Melursus</i>	
College, Personal Assist-		<i>ursinus</i>), and the Indian	
ant to the Imperial Econo-		Lion (<i>Felis leo</i>)	238
momic Botanist; The Im-		KING, R. C. H. MOSS, I.C.S.;	
provement in the yield and		The Resident Birds of the	
quality of Indian Wheat ..	187	Saugor and Damoh Dis-	
IVENS, J. H. A.; Notes on		tricts, Central Provinces ..	87
the Flora of the Vale of		KINGSTON, A. H.; Painted	
Kashmir	701	Snipe (<i>Rostratula capensis</i>)	
JOLLY, Capt. G.G., I.M.S.;		in large numbers	667
Habitat of <i>Echis carinata</i> ..	1340	KINNEAR, N. B.; Golden Cat,	
JONES, A. E.; Notes on Birds		<i>Felis temmincki</i> , killing Buf-	
from Lahore	1073	falo Calf.	237
JONES, R. TEAGUE, Indian		-----;	
Police; Tameness of Great		Notes on Birds round Rawal	
Indian Bustard (<i>Eupodotis</i>		Pindi.. ..	256
<i>edwardsi</i>)	1333	-----;	
KANNAN, K. KUNHI, Asst.		European Great Bustard in	
to State Mycologist and		Chitral	268
Entomologist; <i>Papilio poly-</i>		-----;	
<i>tes</i> in Bangalore	699	The Masked Booby (<i>Sula</i>	
KASARGODE, R. S., Lecturer		<i>cyanops</i>) in Bombay Har-	
on Entomology, Poona		bour	1334
Agricultural College; Cat-		-----;	
terpillar Pest on Cotton in		Notes on the size and	
Khandesh	698	breeding of the common	
KEDDIE, D. L.; Record of		Green Whip-snake (<i>Dryo-</i>	
Snipe Shot at Hminelong-		<i>phis mycterizans</i>)	1336
yee, in the Chiengmai Dis-		-----;	
trict of Siam, 18-15 North		Breeding of the Common	
		Green Viper (<i>Lachesis gra-</i>	
		<i>mineus</i>)	1339

	PAGE		PAGE
KIRTIKAR, Lt.-Col. K. R., I.M.S. (Ret.); A note on <i>Trichosanthes dioica</i>	700	MAGRATH, Lt.-Col. H. A. F.; Notes on Martens in Kash- mir	1320
KUNHIKANNAN, K., M.A., F.E.S., Assistant Entomo- logist, Bangalore; The Bed Bug (<i>Cimex rotundatus</i>) on the Common Yellow Bat (<i>Scotophilus kuhli</i>)	1342	;	
LLOYD, Capt. R.E., I.M.S.; Some disputed points in the Anatomy of a common Indian Earthworm (<i>With</i> 3 <i>Text-figs.</i>)	289	The Habits of Voles (<i>With a</i> <i>diagram</i>)	1322
MAGRATH, Lt.-Col. H. A. F.; Bird Notes by the way in Kashmir (<i>With 2 Text-figs.</i>)...	545	;	
;		Habits of the Kashmir Stag (<i>Cervus kashmiriensis</i>) in summer	1325
The Stoat in Kashmir	653	;	
;		The Himalayan Greenfinch (<i>Hypacanthus spinoides</i>)	1329
The Pintail Duck (<i>Dafila</i> <i>acuta</i>) shot in September	658	;	
;		Flies on Snow	1342
The Paradise Flycatcher (<i>Terpsiphone paradisi</i>)	660	MANNERS-SMITH, Lt.-Col. J.; The so-called One-horned Sheep of Nepal and other Breeds (<i>With a Plate and a</i> <i>Text-fig.</i>)	1066
;		MARSHALL, Major T. E.; Nest- ing of the Cinereous Vulture (<i>Vultur monachus</i>)	264
Note on the Common King- fisher (<i>Alcedo ispida</i>)	661	MARTIN, AYLMER F.; Notes on the Gaur (<i>Bos gaurus</i>)	241
;		MASSY, Capt. W. J., 12th Pioneers; The Life of a Dog Tick	694
The notes of Pallas's Fish- ing Eagle (<i>Haliaëtus leucory- phus</i>) and some water birds. ..	662	MEYRICK, E. B. A., F.R.S., F.Z.S.; Descriptions of Indian Micro-Lepidoptera, Part XIV	104
;		;	
On the Occurrence of the Common Wood Shrike (<i>Teph- rodornis pondicerianus</i>) and the Central Asian Black- bird (<i>Merula maxima</i>) near Peshawar	680	Description of Indian Micro- Lepidoptera, Part XV	852
;		MITCHELL, F. J.; A Sporting Kashmir Fish, the Cheroo (<i>Schizothorax esocinus</i>)	285
More Bird Notes by the way in Kashmir (<i>With 2 Text- figs.</i>)	1304	MOSSE, Capt. A. H., E.I.A.; Immunity of Animals to Snake-bite	295
		;	
		Number of a Panther's (<i>Felis</i> <i>pardus</i>) caudal vertebræ	1319

	PAGE		PAGE
MOSSE, Capt. A. H., E.I.A. ; Saw-scaled Viper (<i>Echis carinata</i>) as a tree snake ..	1339	POCHA, Senior Assistant Sur- geon, J.P., L.M. & S. and BANNERMAN, Surgeon-Gener- al W. B. ; Cobra-breeding at Parel	1337
MULLAN, J. P., M.A. ; The Food of a Bull-frog (<i>Rana tigrina</i>)	1341	POWELL, A. ; Some disputed points in the Anatomy of a common Indian Earthworm.	291
NEWNHAM, Lt.-Col. A., I.A. ; Hornbills devouring young Paroquets	263	PRALL, Lieut.-Col. S. E., I.M.S. ; Falcon and Gulls..	267
OBITUARY NOTICE ; E. W. Oates	651	..... ; Nesting of the Osprey or Sea-Hawk	268
OSMASTON, A. E. ; Eggs of the Large Hawk-Cuckoo (<i>Hiero- coccyx sparveriioides</i>)	1330	..... ; Falcons and their prey ..	680
PARKER, R. N., D. C. Forests ; Notes on Cacti in North- West India	1095	PRIMROSE, ALEX. M. ; Weight and Measurements of a Serow	246
PEILE, A. J. ; Note on <i>Macro- chlamys</i> (<i>Eurychlamys</i>) <i>platy- chlamys</i> (Blanford), etc. ..	707	..... ; Weight and Measurements of a Goral.. .. .	247
PHILIPPE, G. W. V. de Rhè : <i>See DE RHÈ-PHILIPPE, G.W.V.</i>		..... ; The Maroon Oriole (<i>Oriolus traiillii</i>)	676
PITMAN, Lt. C. R. S., 27th Punjabis: The Number of Cubs in a Tiger's litter ..	653	PUNDE, A. B., D. F. O. ; Migration of Baya (<i>Ploceus baya</i>)	675
..... ; Do Chinkara (<i>Gazella ben- netti</i>) drink water?	655	REMINGTON, G. L. ; A Kite's Larder	1082
..... ; The Colouration of Tigers ..	657	REVIEWS ; "Forty years among the Wild Animals of India," By F. C. Hicks ..	645
..... ; A Deformed Head of the Four-horned Antelope	658	..... ; "Medical Entomo- logy," By A. Alcock ..	649
..... ; The Painted Snipe (<i>Rostra- tula capensis</i>)	666	ROBINSON, S. M. ; Nesting Notes from Lower Burma..	261
..... ; Notes on the Southern Migration of Snipe near Cal- cutta, 1911	684	..... ; Nidifica- tion of Davison's Babbler (<i>Turdinulus evsul</i>)	1088
		RODGERS, A. ; The Banting or Tsaing (<i>Bos sondaicus</i>). (<i>With a Text-fig.</i>)	656

	PAGE		PAGE
ROGERS, C. GILBERT; A Natural Bird-lime	293	STONE, F. H. S.; Chinese Gold Fish (<i>Carassius auratus</i>)	1100
SAUNDERS, H. F.; "Poison- ous" Lizards in India ..	1341	-----; Horse- Mackerel attacking Jelly Fish	1101
SCOTT, Lieut. F. B.; Curious behaviour of a Myna ..	256	STONEY, R. F.; Swinhoe's Snipe (<i>Gallinago megala</i>) near Madras	1083
-----; The Shel- drake (<i>Tadorna cornuta</i>) in the United Provinces ..	1089	-----; A branch- ing Palmyra Palm (<i>Borassus flabellifer</i>). (<i>With a Text- fig.</i>)	1098
-----; Intelli- gence of Ants	1092	TENISON, Lieut. W. P. C., R. F. A.; Distribution of the Cricket (<i>Schizodactylus mons- truosus</i>)	1091
SEN, S. K., Asst. to 2nd Imp. Ent.; Asilid Oviposition. (<i>With a Text-fig.</i>)	695	THEISSEN, F., S. J.; The Fungi of India. Part I. (<i>With Pls. I.-IV., and Text- figs. 1-10</i>)	1273
SHORTRIDGE, G. C.; Notes on the Time of Appearance and Flight of Eastern Bats ..	1321	TRENCH, C. CHENEVIX, I.C.S.; Notes on the Indian Chamæ- leon (<i>Chamaeleon calcaratus</i>)..	687
-----; The Indian Buffalo (<i>Bubalus bubalus</i>) ..	1323	TURNER, ROWLAND E., F.Z.S., F.E.S.; A Monograph of the Wasps of the Genus <i>Cerceris</i> inhabiting British India. With Notes on other Asiatic Species. (<i>With Pls. A. & B.</i>)	476
SKINNER, Capt. R. B., R. E.; Seasonal movements of the Himalayan Greenfinch (<i>Hy- pocanthus spinoides</i>)	262	-----; A Monograph of the Wasps of the Genus <i>Cerceris</i> inhabit- ing British India. With Notes on other Asiatic Spe- cies. Part II. (<i>With Pls. C. & D.</i>)	794
SMITH, EDGAR A., I. S. O.; Des- cription of a new Species of <i>Aemæa</i> from Bombay, and Notes on other forms from that locality. (<i>With a Text- fig.</i>)	637	TYTLER, Major H. C., 17th Infantry; Notes on Butter- flies from the Naga Hills. Part I. (<i>With Pl. A.</i>) ..	48
SMITH, J. H.; Notes on the Cutch Ammonites. (<i>With a Map and 2 Diagrams</i>) ..	709		
-----; Notes on Cutch Ammonites. II. (<i>With 2 Diagrams</i>)	1347		
SMITH, Lieut.-Colonel J. MANNERS; See MANNERS- SMITH, J.			
SMITH, Major O. A., 27th Punjabis.; Large Common and Banded Kraits.. ..	283		
SPALDING, Capt. W. B., R. A.; Jack Snipe in the Cawnpore District	264		

	PAGE		PAGE
TYTLER, Major H. C., 17th Infantry; Notes on Butterflies from the Naga Hills. Part II. (<i>With Pl. B.</i>) ..	588	<i>chalis</i> (Beddome) in Berham-pur, Orissa	279
VENNING, Capt. F. E. W.; Occurrence of Swinhoe's Snipe (<i>Gallinago megala</i>) at Myitkyina, Upper Burma ..	269	Is <i>Lycodon gammiei</i> (Blanford) an aberrant specimen of <i>Lycodon fasciatus</i> (Anderson)?	279
Some Birds and Birds' Nests from Haka, Chin Hills.	621	Remarks on the Greater and Lesser Black Kraits (<i>Bungarus niger</i> , and <i>B. lividus</i>)	281
Snake eating a Snipe ..	689	The Development of Embryo in the Eggs of the Oviparous Viper (<i>Lachesis monticola</i>), prior to oviposition.. ..	284
Some Notes on the Hatching of the Agamoid Lizard (<i>Calotes jerdoni</i>). (<i>With a Text-fig.</i>)	690	A Popular Treatise on the Common Indian Snakes. Part XVII. (<i>With Pl. XVII.</i>)	447
A Fly Trap (<i>Boucerosia crenulata</i> , Wight & Arn.) ..	707	Rambling Notes on Natural History in Chitral (<i>With 2 Text-figs.</i>)	614
VIJAYARAJJI, The Maharaj KUMAR SHRI; Goose-shooting in Cutch.. ..	678	A New Snake, <i>Psammophis triticeus</i> , from Baluchistan. (<i>With 2 Text-figs.</i>)	634
WALL, Major F., I. M. S., C. M. Z. S.; A Popular Treatise on the Common Indian Snakes. Part XVI. (<i>With Pl. XVI. and Diagram and Maps.</i>)	1	The Breeding of the False Himalayan Viper (<i>Psammodynastes pulverulentus</i>) ..	686
Reptiles collected in Chitral.	132	Food of the Snake <i>Rhabdops bicolor</i>	686
A New Snake from the Western Himalayas (<i>Trachischium quinquelabialis</i>). (<i>With a Text-fig.</i>)	201	Breeding of Maclelland's Coral Snake (<i>Callophis maclellandi</i>).. ..	693
Remarks on Two rare Blind Snakes. (<i>With a Text-fig.</i>)		A Popular Treatise on the Common Indian Snakes. Part XVIII. (<i>With Pl. XVIII., Diagram and Map.</i>)	1009
On the Occurrence of the Snake <i>Dipsadomorphus nu-</i>			

	PAGE		PAGE
WEBB, M., I. C. S.; Occurrence of the Nukhta or Comb-duck (<i>Sarcidiornis melanonota</i>) in Sind ..	685	WHITEHEAD, Captain C. H. T.; Notes on the Birds of Sehore, Central India, with Special Reference to Migration	153
WHISTLER, H., Indian Police.; Notes on Birds round Rawal Pindi.. .. .	256	WILLIAMSON, W. J. F.; Occurrence of the Fantail Snipe (<i>Gallinago caelestis</i>) in Siam..	269
Some winter visitors to Rawal Pindi:	262	WILSON, Major ALBAN, 8th Gurkhas; Some notes from the Abor Expedition. (<i>With a Text-fig.</i>)	1068
Occurrence of European Striated Swallow (<i>Hirundo rufula</i>), in Kangra	659	WITT, D. O., I. F. S.; Occurrence of the Fantail Snipe (<i>Gallinago caelestis</i>) in Siam .	269
Immature Plumage of Lammergayer (<i>Gypaëtus barbatulus</i>)	663	WROUGHTON, R. C., F. Z. S.; Further Notes on some Mammals from Lower Sind ..	175
Nestling Plumage of the Great Stone Plover (<i>Esacus recurvirostris</i>)	1074	Some New Indian Rodents. (<i>With a Plate and 2 Text-figs.</i>)	338
The Himalayan Greenfinch (<i>Hypacanthis spinoides</i> , Vigors)	1074	Some New Indian Mammals. (<i>With a Text-fig.</i>)	767
The Long-tailed Grass Warbler (<i>Laticilla burnesi</i> , Blyth)	1080	See BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA.	
WHITEHEAD, Major J. H., 93rd Burma Infantry; Woodcock (<i>Scolopax rusticula</i>) in South Andamans	1085	YATES, Capt. G. A. HASSELS— See HASSELS-YATES, Capt. G. A.	
		YOUNGHUSBAND, A. D., C.S.I., I.C.S., Commissioner in Sind. Letter from, on Cruelty to Wild Fowl in Sind	1356



ERRATA.

Cover of Part 1, line 9, *for on read from.*

„ „ „ 1, last page, line 4, *for Podicepes read Podicipes*

„ „ „ 1, „ „ „ 5 „ *albipenis read albipennis.*

„ „ „ 1, „ „ „ 30 „ *polytes read polytes.*

Page 29, line 22, *for Dr. Aitchinson read Aitchison.*

Contents of Part 1, line 32, *for Pantail read Fantail.*

„ „ „ 1, „ 35, *for page 272 read 271.*

Page 58, line 19, *for Stibochiana read Stibochiona.*

„ 64, lines 8 and 9, *for Cirrhochoa read Cirrochoa.*

„ 64, line 12, *for Angynnis read Argynnis.*

„ 95, „ 1, *for Pyrrhulanda read Pyrrhulanda.*

„ 98, „ 38, *for Perenopterus read percnopterus.*

„ 99, „ 31, *for Mertin read Merlin.*

„ 157, „ 15, *for Ballon's read Baillon's.*

„ 157, „ 17, *for Crane read Crake.*

„ 157, „ 29, *for phæops read phæopus.*

„ 157, „ 42, *for March read Marsh.*

„ 159, „ 7, *for Marecca read Mareca.*

„ 159, „ 13, *for Querquedecula read Querquedula.*

„ 159, „ 25, *for ferrina read ferina.*

„ 161, „ 36, *for superciliaris read superciliaris.*

„ 164, „ 24, *for Franklina read Franklinia.*

„ 165, „ 34, *for maderapatensis read maderaspatensis.*

„ 166, „ 36, *for torcuatus read torquatus.*

„ 180, „ 29, *for Recurirrostris read Recurvirostris.*

„ 180, „ 33, *for bruneicephalus read brunneicephalus.*

„ 180, „ 34, *for Fulca read Fulica.*

„ 181, „ 22, *for strepserus read streperus.*

„ 181, „ 23, *for penolope read penelope.*

„ 181, „ 28, *for clyptea read clypeata.*

„ 181, „ 38, *for Syrhaptes read Syrrhaptes.*

„ 184, „ 8, *for Wadell's read Waddell's.*

„ 184, „ 8, *for Barbax read Babax.*

„ 184, „ 8, *for Wadelli read Waddelli.*

„ 185, „ 8, *for Propassers read Propasser.*

- Page 227, line 4, for *hirtellas* read *hirtellus*.
- „ 266, „ 16, for *strata* read *striata*.
- „ 299, „ 15, for *Catapsilia* read *Catopsilia*.
- „ 406, „ 41, for *elliotti* read *elliotti*.
- „ 422, „ 43, for *Dascochæta* read *Dascoehæta*
- „ 423, „ 5, for „ „ „
- „ 431, „ 15, for *Spodopotera* read *Spodoptera*.
- „ 444, „ 4, for *Hypoprigea* read *Hypoperigea*.
- „ 588, „ 24, for *Z* read *L*.
- „ 594, „ 1, for *Mejisba* read *Megisba*.
- „ 601, „ 8, for *Hypolijæna* read *Hypolycæna*.
- „ 614, „ 21, for *valgaris* read *vulgaris*.
- „ 661, „ 35, for *frogs* read *fry*.
- „ 704, „ 32, for *molliusculus* read *molliusculus*.
- „ 752, „ 1, for *eyrypylus* read *eurypylus*.
- „ 800, „ 27, for *allopicta* read *albopicta*.
- „ 878, „ 4, for Part III, read IV.
- „ 972, „ 35, after *agenor* insert (♀ d, butlerianus, Roth.,
(♀ d, alcanor, Cr.)
- „ 984, „ 46, (*Phengaris*) *sarta* lower to line 48.
- „ 984, „ 47, *atroguttata*, Dohn. „ „ „ 50.
- „ 988, „ 32, for *ephyrus* read *Zephyrus*.
- „ 989, „ 13, for *kohmensis* read *kohimensis*.
- „ 989, last line, for *S* read *An*.
- „ 990, line 26, for *Apporosa* read *Apporasa*.
- „ 992, last line, for *Sounguva* read *tounguva*.
- „ 998, line 40, for *Cnaiolade* read *Coladenia*.
- „ 1008, „ 39, for p. 573 read p. 578.
- „ 1133, delete Fig. 21 and block (see under *Pieris brassicae*
in The Common Butterflies of the Plains of India,
No. 1, Vol. xxii.)
- „ 1135, at bottom of delete key under Genus *Huphina* and
insert—
- A. Underside hindwing : veins more
or less broadly bordered with or
delated with, dusky black *nerissa*,
(Pl. I, figs. 61 ♂, 61 ♀.)

B. Underside hindwing : veins not
bordered with dusky black remba.

Page 1136, line 12, for J. read I.

„ 1136, „ 21, for *Anaphæis* read *Pareronia*.

„ 1140, „ 26, for J. read I.

„ 1144, explanation of Plate I, for *Pereronia hippa* read *Pareronia pingasa*.

„ 1144, „ „ add 63 A. *Pareronia hippia* ♀.

„ 1145, line 38, for strigoe read strigæ.

„ 1147, „ 22, for *Cratæva* read *Cratæva*.

„ 1148, „ 8, for narrows read narrow.

„ 1150, „ 7, for broad base-short read broad-based, short.

„ 1150, „ 37, for *Dirtera* read *Diptera*.

„ 1152, explanation of Plate J, fig. 65 b is *Ixias mariannæ*
and not *I. pyrene*.

„ 1156, line 15, for booklets read hooklets.

„ 1169, „ 21, for *garetta* read *gazetta*.

„ 1209, „ 22, for *swinhoii* read *swinhoei*.

„ 1218, „ 13, for G read L.

„ 1304, 2 lines from the bottom, for *nepalensis* read *neglecta*.

„ 1306, line 18, for pregnacious read pugnacious.

„ 1310, „ 28, for flock read flocks.

„ 1321, „ 11, for small read large.

„ 1321, „ 13, above *Megadermatidae* insert *Hipposiderus*
(small) - - - late - - - similar to *Rhinolophus*.

25

THE
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EDITED BY
W. S. MILLARD,
R. A. SPENCE and N. B. KINNEAR.



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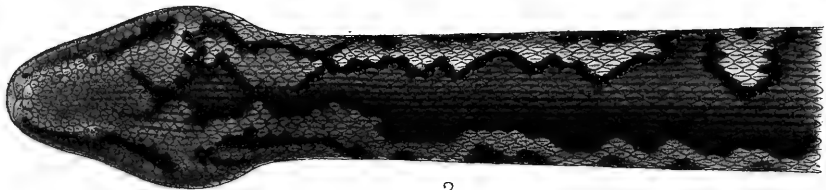
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CONTENTS OF THIS NUMBER.

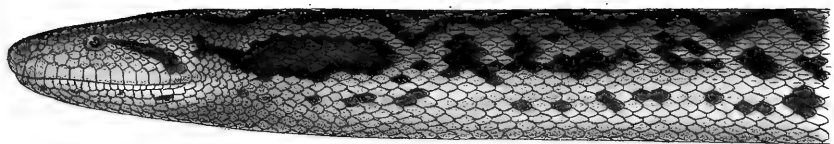
	PAGE.
A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVI. (<i>With Plate XVI, and Diagram and Maps.</i>) By Major F. Wall, I.M.S., C.M.Z.S.	1
THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part V. <i>The Great Bustard and Little Bustard.</i> By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.....	20
NOTES ON THE BUTTERFLIES ON THE NAGA HILLS. Part I. (<i>Plate A.</i>) By Major H. C. Tytler, 17th Infantry ...	48
THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part V. (<i>With Plates XVIII—XXV, and text figures 13—19.</i>) By E. Blatter, S.J.....	66
THE RESIDENT BIRDS OF THE SAUGOR AND DAMOH DISTRICTS, CENTRAL PROVINCES. By R. C. H. Moss King, I.C.S....	87
DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA. Part XIV. By E. Meyrick, B.A., F.R.S., F.Z.S.	104
REPTILES COLLECTED IN CHITRAL. By Major F. Wall, I.M.S., C.M.Z.S.	132
A LIST OF INDIAN FUNGI, CHIEFLY OF THE BOMBAY PRESIDENCY, WITH THE DESCRIPTION OF TWO NEW SPECIES. (<i>With a Plate.</i>) By E. Blatter, S.J.	146
NOTES ON THE BIRDS OF SEHORE, CENTRAL INDIA, WITH SPECIAL REFERENCE TO MIGRATION. By Capt. C. H. T. Whitehead	153
ORCHIDS OF THE BOMBAY PRESIDENCY. Part XII. (<i>Plate XI.</i>) By G. A. Gammie, F.L.S.....	171
FURTHER NOTES ON SOME MAMMALS FROM LOWER SIND. By R. C. Wroughton	175
SOME NOTES ON THE BIRDS FROM GYANTSE AND CHUMBI IN TIBET, WITH A LIST OF THE GAME BIRDS KILLED DURING THE FOUR YEARS, 1906-1909. By Capt. F. M. Bailey..	178
THE IMPROVEMENT IN THE YIELD AND QUALITY OF INDIAN WHEAT. By Albert Howard, M.A., A.R.C.S., F.L.S., Imperial Economic Botanist, and Gabrielle L. C. Howard, M.A., Associate and some time Fellow of Newnham College, Personal Assistant to the Imperial Economic Botanist	187



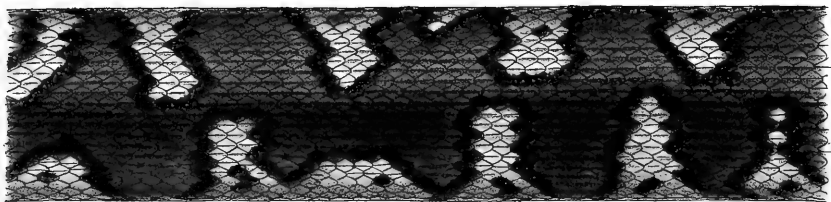
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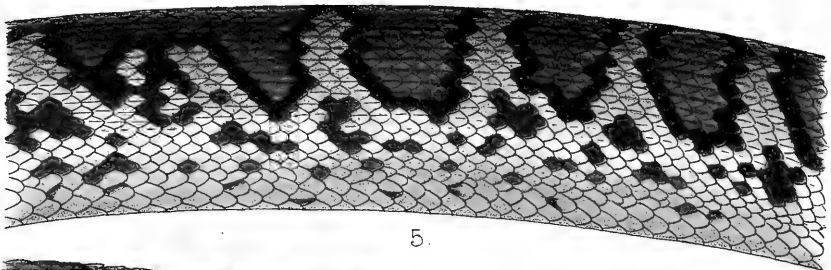
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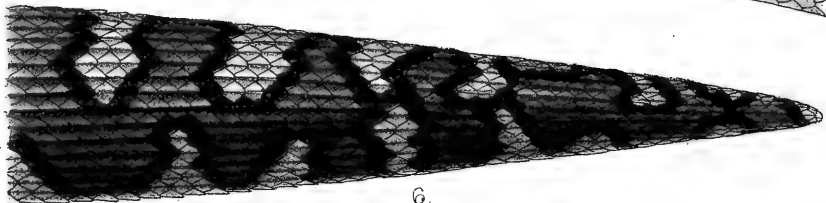
3.



4.



5.



6.

J. G. del.

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1. *Eryx johnii*, harmless, nat. size. 2-6, *Eryx conicus*, harmless, nat. size.

JOURNAL OF THE Bombay Natural History Society.

OCT. 1911.

VOL. XXI.

No. 1.

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVI with Plate XVI and Diagram and Maps.

(Continued from page 953 of Volume XX.)

Introductory remarks.—The subjects of this paper belong to the *Boidæ*, a family comprising the boas, and the pythons. There are many representatives scattered over all five Continents. These snakes are characterised by the possession of rudimentary hind limbs, and a rudimentary pulvis, the termination of the former being more or less visible as claw-like processes situated on each side of the body in a fold or dimple above the anus.

The family is divided into two sub-families, *viz.*, *Pythonince* in which there is a bone (the supraocular) distinct from the frontal forming the roof of the orbit, and *Boinae* in which the frontal alone forms the orbital roof. The latter includes 13 genera of

which *Eryx* is one. The genus *Eryx* of which *jaculus* is the type has seven species inhabiting North and East Africa, and Central and Southern Asia. Three of these, viz., *jaculus*, *conicus*, and *johni*, occur within Indian limits.

ERYX CONICUS (SCHNEIDER).

RUSSELL'S EARTH SNAKE.

History.—* The first certain reference to this snake was made by Russell who described and figured it unmistakeably in 1796. It is not certain, whether the *Vipera orientalis* referred to by Seba in 1734, or the *Serpens indica* of Boiquatrazza, are identical with *E. conicus*, though this may be the case.

Nomenclature—(a) *Scientific*.—The generic name appears to be derived from the Greek “eruo” I drag along, probably in allusion to the feeble powers of progression of the type *jaculus*. Daudin introduced the name in 1803. *Conicus* from the Latin conical, suggested itself to Schneider in 1801, on account of the peculiar short and conically shaped tail.

(b) *English*.—The Common Earth Snake suggests itself, but the fact that John's Earth Snake (*E. johni*) is also common, deters one from accepting this as appropriate. I think Russell's name should be associated with it, and Linné's name with its close ally *jaculus*.

(c) *Vernacular*.—It is confused by natives so frequently with John's Earth Snake, that many of the names in use apply to both species. Russell says about Vizagapatam it is called “padain cootoo,” “mondi poda,” and “manooli pampoo” (pamboo?). The last is certainly one of its commonest names in S. India, and is the Tamil for “earth-dweller.” Other common names are “manoo pamboo” or earth snake, “mannary,” “mannooly,” or mannooni” malayalanm words meaning “sand or earth eater.” “Mandally” is another, and the one in frequent use about Malabar. I have known it called “kuley pamboo” or mud snake and Russell also mentions “pedda poda.” In Mysore its Canarese name is “itallay havu” or “two-headed snake.” Mr. Millard tells me that at Ratnagiri it goes by the name of “kander,” and about

* Ind. Serp., Vol. 1, p. 5, pl. IV.

Bombay as "kakria." Mr. D'Abreu tells me the Hindi name is "thut-thur-samp" or "snouted snake." In the Punjab, and in Bengal it is often called "do muha" or "two-mouthed" (Hindi, and Punjabi), but this is more appropriately the name for *Eryx johni*.

General characters.—It is of a markedly stout habit, the body being short and heavy, and the tail short. The body is broader in its transverse direction than its vertical, and stoutest about the middle. It attenuates somewhat, and very gradually in both directions, passing almost insensibly into the head so that there is but slight indication of a neck. It is rough dorsally owing to the keeled condition of the scales, and this roughness becomes more pronounced posteriorly. At each side just above the vent is a small curved claw-like process directed downwards in the ♂ and a small pointed process directed backwards in the ♀, which indicate the termination of the rudimentary hind limb. This is far more developed in males, and is frequently supposed to be the male copulatory organ by those not conversant with ophiology. In females the development of this process is so small that it is usually overlooked* leading to a popular belief that, it is the male only that bears it, hence the idea, no doubt, that it is the male sexual organ. Most of the limb is concealed within the muscular tissues but if dissected out by competent observers, the analogues of many of the bones seen in the limbs of other vertebrates can be traced up to its origin in the rudimentary pulvis. The head is moderately elongate, rounded evenly from side to side, and has a more or less pronounced temporo-occipital eminence, on either side. The snout is long, rounded laterally owing to a complete absence of any canthus rostralis, and broadly rounded in front. It overlaps the chin, to an extent often equalling the diametre of the eye and is not provided with the transverse ridge in front, which is seen in both the other Indian representatives of this genus, nor has it the groove beneath the chin, (mental groove) which is characteristic of these two species (*jaculus* and *johni*). The eye is very small, its diametre being only about one-third the length of the snout. Its

* Nicholson (Ind. Snakes, p. 3.) says the ♂ alone has them.

pupil is vertically elliptical, and its iris beautifully speckled with gold. The nostril is slitlike, and placed high on the snout. The tongue is pale at the base, but blackish at the tips. The tail is short, and tapers very rapidly so that it is conical in shape. It is even rougher above than the hinder part of the body.

Colouration.—The under parts are buff, uniform, or with but little trace of mottling. In the flanks there is a mottling of brown, sometimes of a light shade, sometimes as deep as chocolate. At first very fine this mottling becomes coarser as it ascends the flanks, and then vertical bars of the ground colour pass up to the spine. These bars are much narrower than the intervals. When they meet over the back large somewhat irregularly squarish blotches are formed which proceed from the nape to the tail tip. More often the bars of the two sides alternate, and an irregular dark patchy confluent pattern results. The head is light above with sometimes dark speckling especially about the lips, and a dark irregular stripe passes from the eye to the gape. Dr. Annandale*, who captured a mother and young, says the latter are more brilliantly coloured.

Identification.—Russell's earth snake is very like Linné's earth snake (*jaculus*), so much so that I have no doubt the two have been confused repeatedly in the Punjab where they are associated. It was only in 1909 in this journal that I reported the occurrence of *jaculus* for the first time within Indian limits, the specimen being captured at Jhelum. Whether it is as rare as this single record might lead one to suppose, remains to be seen.

The dual association of small head scales, with ventrals so narrow that they are only twice or little more than twice the breadth of the last costal row, suffices to pronounce the snake an *Eryx*. *Conicus* differs from the other two Indian species (*johni* and *jaculus*) in having no groove beneath the chin, and no angular transverse ridge on the rostral shield, so that the identification is extremely easy. A similar specimen with a conical tail, mental groove, and angular ridge on the rostral would prove to be *jaculus*.

Dimensions.—The largest specimen I know of was a gravid ♀

* Mem. As Soc., Bengal, Vol. 1. 10, p. 193.

killed in Trichinopoly by the Revd. C. Leigh, s.j., which he said taped 2 feet 9 inches. I saw another large specimen (not of local origin) in the St. Joseph's College collection, Darjeeling, that measured 2 feet 7 inches. The largest I have had myself were 2 feet $4\frac{3}{4}$ inches, 2 feet $3\frac{1}{4}$ inches, and 2 feet $1\frac{1}{2}$ inches. Specimens over 2 feet are not common.

Habits.—It is generally stated to be a desert snake, but it is by no means confined to desert tracts. It was a very common snake in Malabar, where the annual rainfall was about 150 inches, and the soil supported a particularly luxuriant vegetation. Father Dreckman tells me he has frequently seen it in the Western Ghats at an elevation of 2,000 feet (Khandalla), a locality favoured with 200 inches annual rainfall and a flourishing forest growth.

Like the rest of its genus it is an earth snake, but though it does not possess even a rudimentary indication of the transverse ridge which all the other members of the genus have developed, and which they use for digging purposes, it does not appear to me to suffer from the want of it, for it burrows into loose soil quite as easily, and expeditiously as *Eryx johni*, the species which exhibits this ridge in its most exalted state of development. Possibly were it to test its powers in harder soil against John's earth snake, the latter would show its superiority.

Though an earth snake its life is by no means completely subterranean. Were it so, doubtless by now it would have acquired, or be acquiring the condition of ocular degeneration seen in the blind snakes (*Typholidæ*), a family in which the eyes have undergone a devolution process brought about by a protracted residence in darkness.

From what I know of *conicus* I feel confident that a considerable period of its life is spent either above the soil, or in the most superficial layers, into which light is admitted and by its stimulus the function of the eye has been preserved. As a result this organ beyond being small, is quite as well developed, and vision seemingly quite as good, as in colubines, and other highly organised representatives of the order.

The specimens I have kept myself, and that I have seen in captivity elsewhere I have frequently noticed are often to be seen

above the soil which has been provided for them to conceal themselves beneath, and in some cases where no earth was given it appeared to thrive just as well without it, and for long periods. The only specimen I remember not having seen for many days was missing when I came to investigate! It had evidently contrived to reach the top of the sides of the box in which I had placed it and so effected its escape. A large number of those brought in to me were reported above the ground, and many of those were discovered in broad daylight. It is also evident that it must have been above ground, and in daylight in the instances where it had managed to capture squirrels. On the other hand I have frequently had specimens brought in that were found beneath the soil, their refuge being disturbed by human earth operations. In these cases it appeared to have retired from active life. In Cannanore it was in the hot and dry weather that it was most often abroad, being as common in that season, as it was scarce in the monsoon.

Disposition.—Russell's Earth Snake is a dull, phlegmatic creature, and a most uninteresting occupant of the vivarium. The ones I had in captivity were generally to be seen lying above the earth, or only partially buried, and remained motionless for hours together. They were not easily roused, except when the food was offered them, and then they showed an interest in life not seen at other times. I have played with many specimens, but it has a nasty uncertain temper, and one has to handle it with caution to avoid being bitten. It will lie on the ground motionless, take little notice of teasing, and just when one begins to think the reptile has no vice in its composition, and will submit to a touch, it suddenly springs forward, and implants its teeth into one's hand, and it can bite with considerable force. Although careful in my dealings with it, I have been bitten several times, the suddenness of the assault giving me no chance to withdraw my hand, as one can do with so many other snakes, when familiar with their ways. Russell remarks of one he had sent him that it bit ferociously. Mr. Boulenger* says the one he kept had a fierce temper, and Father

* Faun. Brit. Ind. Rept., p. 247.

Dreckman tells me that he thinks it is one of the most vicious members of all snakedom, ready to snap at anything at a moment's notice. He was bitten by the first snake that he ever encountered in this country which happened to be a *conicus*. Dr. Henderson says that in his experience it is a sluggish snake, but occasionally it strikes out fiercely when irritated. Mr. D'Abreu tells me he kept a pair for a long time. He says when first captured it is very fierce, biting readily when touched, but after a little handling it gets quite tame, and never bites no matter how much it is handled. Certainly the specimens which accompany many jugglers allow themselves to be handled without betraying any malice. I have known some specimens when irritated, sulk in a most determined manner, remaining quite motionless, and refusing to offer any malice. Sometimes indeed it hides its head beneath its body, and remains so for many minutes. It will often flatten its body to the ground when alarmed, like many other snakes do.

Habits.—Whether this snake is in the main nocturnal I do not know. At any rate it is very frequently abroad by daylight, and even in the midday glare of the hot weather, frequently establishes itself beneath trees in S. India where it lurks for the purpose of catching the squirrels (*Funambulus palmarum*) when they descend. With this object I believe it partially buries itself, and patiently awaits the chance of a squirrel coming within reach, and the chances are not so remote as one might imagine who does not know Southern India, for the squirrels there almost amount to a pest. They are always on the move, and frequently descend, and wander about beneath the trees. In this connection I believe whatever the original function of the keels on the scales of snakes and lizards may have been, that they are of material advantage to a snake like *Eryx conicus*, for they undoubtedly assist its effectual concealment. As the snake noses its way through the surface soil, the particles of earth lodge in the grooves formed between the keels on its back and serve to conceal its serpentine form. Were the body smooth the particles would roll off, and expose more or less of the snake's body, unless buried so deeply as to hamper its movements when the quarry came within reach. This function

of the keels in snake's, is also seen in desert snakes like the horned vipers (*Cerastes*) that lie partially concealed in the sand. The movements of Russell's Earth Snake are laboured, and slow, and it is impossible for the creature to proceed at any pace other than a crawl. The reason for this is apparent when the snake is laid on its back. The shields on the belly are very narrow compared to those of colubrines and vipers. They only occupy some two-fourths of the middle of the belly breadth, and as the ribs are attached to them, those bones are very much bowed, leaving one-fourth of the body on each side, without a support.

As a snake moves on its ribs, the body which in this snake is unusually massive has only half its breadth supporting it during progression.

Food.—Its food is almost exclusively of a mammalian order. Those I had in captivity in Trichinopoly persistently refused frogs, and lizards, and my servant told me their usual fare was squirrels (*Funambulus palmarum*). Following his advice I gave them squirrels whenever I could get them, and they were always taken eagerly.

The distension of a snake about 20 inches long after swallowing a squirrel may well be imagined, but although the process of incorporation was a protracted one, no misadventure occurred. On two occasions in Cannanore specimens were brought to me that had been discovered in the act of devouring full grown squirrels, in one case the snake was only 1 foot $4\frac{1}{2}$ inches long! A third specimen contained a relatively large mammal in its stomach which appeared to be a squirrel. Mr. D'Abreu fed his specimens on mice which they ate with avidity, and grew very fat upon. A captive specimen in Madras Museum ate in one year 57 mice, another 65 rats, and a third 51 mice, and 1 rat in the year. A specimen brought in to me at Cannanore had eaten a large frog (*Rana tigrina*), but reptiles are not usually acceptable. Mr. D'Abreu says that a lizard of the genus *Calotes* was very promptly despatched by one of his captive specimens but no attempt was made to eat it subsequently. Mr. Millard tells me that one in our Society's room tried to eat a young snake (*Tropidonotus piscator*), and the Revd. J. Castels, S.J., told me of one he had in

captivity that killed a green whipsnake (*Dryophis mycterizans*) with which it was quartered.

Like other boas it kills its victims by constriction, and the strength of its body is such that the life is crushed out of a squirrel or mouse in a few seconds, and until life is extinct it does not commence swallowing.

The sexes.—Of the 18 specimens I sexed in Cannanore 9 were ♂ ♂, and 9 ♀ ♀, showing that the sexes are evenly balanced. The ♀ appears to grow distinctly larger than the ♂. I never had a male reaching a length of 2 feet, though I have had 3 ♀ ♀ exceeding that length. The largest record I have already alluded to was also a ♀ Mr. Leigh's 2 foot 9 inch. specimen. The development of the tail differs in the sexes, the length being in favour of the ♂, in which this appendage accounts for from one-eleventh to one-fourteenth the total length of the snake. In the ♀ it is from one-fourteenth to one-seventeenth the total length. There appears to be another sexual difference judging from my notes, and this is in the costal rows which number in midbody 47 to 51 in the ♀, and from 43 to 48 in the ♂.

Breeding.—Our knowledge of the breeding is not what it ought to be when one considers what a common snake it is, and how well it thrives in captivity. In Southern India the season of matrimonial intercourse is about November, but we do not know whether the snake is oviparous or viviparous. I had a gravid ♀ killed in camp on the 7th of December at Cannanore within which were 6 largish eggs, perhaps an inch long. Mr. Leigh told me of one he had in Trichinopoly that contained 16 eggs about half an inch in length, in early January. Dr. Annandale* however mentions a ♀ specimen said to have been found with 3 young ones at Ramanad in August. The smallest specimen I know was a ♂ 8 $\frac{7}{8}$ inches long in November, but whether a hatchling or not I could not say. One noticeable feature in the young is that the navel is placed very much further away from the anus than is the case with colubrine snakes. I have counted no less than 43 ventrals intervening.

* loc. cit.

Sloughing.—A few notes were made in Madras a few years back. One specimen desquamated on the 18th of April, 18th of May, 6th of August, and 9th of October in 1895. Another (perhaps the same snake) shed its skin on the 30th of April, 4th of June, 22nd of July, and the 4th of October 1896. Another (perhaps the same specimen) cast its slough on the 13th of June, 23rd of September, and 24th of December 1897.* Like our other Indian representatives of its family, its ecdysis occurs about 4 times a year at rather irregular intervals.

Parasites.—I have paid very little attention to this subject, but it is almost certainly infested with Entozoa like the python, and most other snakes. I have found ticks attached to its skin, and those though not identified are almost certain to prove a species of *Aponomma*. A blood parasite the *Hæmogregarina cantliei* has been discovered inhabiting the blood cells.†

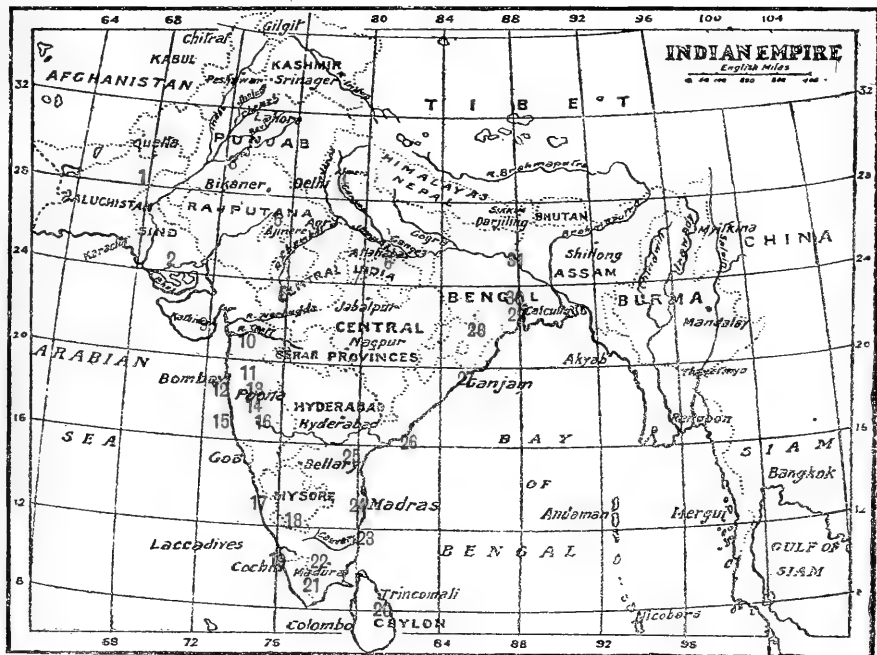
Distribution.—Peninsula India from the base of the Himalayas to Cape Comorin, and Northern Ceylon. In the North-West it extends to Sind and Baluchistan, and in the North-East to Behar and Lower Bengal. Major H. H. Magrath sent me a fragment of a skin of an *Eryx* from Bannu that might be this species or *jaculus*, more probably the latter.

It is a snake of the Plains, but like many other species ascends some distance into hilly regions. There are specimens in the British and the Indian Museums of Colonel Beddome's collecting from the Anamallays, altitude not specified. Father Dreckman has met with it in Khandalla, (*circa* 2,000 ft.) and there is a specimen from Poona (*circa* 3,000 ft.) in our Society's collection. In the Indian Museum there is a single example from Palair in the Naini Tal District, but the altitude is not recorded. Von Schlagentweit's specimen in the British Museum is reported from Sikkim—a most improbable locality—though of course it is possible it may have been acquired from a juggler, this snake being seen so frequently in the possession of this nomadic class.

The accompanying map shows the precise localities from which it has been reported.

* This valuable information was communicated to me by Dr. J. R. Henderson.

†Manson. Trop. diseases 1907, p. 819.

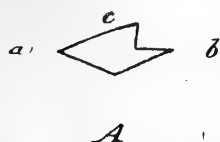


DISTRIBUTION OF *ERYX CONICUS*.

B. M. implies British Museum, I. M. Indian Museum, Bo. M., Bombay Society's Collection, F. W., the Writer.

1. Fort Munro, Baluchistan (Bo. M.). 2. Sind (Murray & B. M.). 3. Multan (Bo. M.). 4. Palair, Naini Tal District (I. M.). 5. Gwalior (B. M.). 6. Allahabad (I. M.). 7. Saugor (Bo. M.). 8. Neemuch (Bo. M.). 9. Rajkot, Kathiawar (F. W.). 10. Khandeish (Bo. M.). 11. Nasik (Bo. M.). 12. Bombay (Bo. M.). Khandalla (Dreckman). 15. Ratnagiri (Millard). 16. Hingoli, Deccan (Bo. M.). 17. Malabar (Dumeril et Bibron & F. W.) 18. Anamallays (B. M. & I. M.). 19. Travancore (Ferguson). 20. Trincomalee, Ceylon (Bo. M.). 21. Ramnad (I. M.) 22. Trichinopoly (F. W.). 23. Pondicherry (Dumeril et Bibron). 24. Madras (Russell & B. M.). 25. Godavary (Blanford). 26. Vizagapatam (Russell). 27. Chandbatty, Cuttack District (I. M.). 28. Chota Nagpur (I. M.). 29. Singbhum (I. M.). 30. Manbhum (I. M.). 31. Behar (D'Abreu in *epistola*).

Lepidosis.—*Rostral* much broader than high, not ridged transversely. Touches six shields, the anterior and posterior nasals and 1st labial. *Internasals*.—Absent. The small scales on the top of the head become first mammillated, and then carinate as they proceed backwards. *Nasals*.—Two, an anterior and a posterior with the nostril between. The eye is surrounded by small scale only, and one or two rows of scales intervene between it and the supralabials. *Supralabials*.—12 to 15, the anterior largest, and distinctly higher than broad. *Mental*.—Small. *Infralabial*.—17 to 20, the anterior largest, much deeper than broad, the first do not meet behind the mental. *Costals*.—Two heads-lengths behind the head 38 to 46, midbody 40 to 53, two heads-lengths before vent 24 to 35; keeled (except the 7 to 10 lowest rows anteriorly, 9 to 13 in midbody, and 2 to 6 posteriorly). The keels are peculiar, seen in profile they gradually incline upwards from the base of the scale to a point about one-third from the apex when they decline to the apex. In the most posterior scales they suddenly



decline from the summit, so that they appear in outline as shown in our diagram. The dorsal scales are a shade longer than broad, those in the last 3 subcostal rows progressively increase in size, and their breadth exceeds

their length, the last being $\frac{1}{2}$ or a shade less than $\frac{1}{2}$ the breadth of the ventrals. *Ventrals*.—Narrow, 162 to 186. *Anal*.—Divided into 3 parts, a larger median, and two small lateral portions. *Subcaudals*.—17 to 24, frequently entire, but usually some, often many divided.

Dentition.—The *maxillary* teeth number from 13 to 15, the first 3 progressively increase, and the posterior gradually decrease in length. The *palatine* are 5 in number, and the *pterygoid* 14 to 15. The *mandibular* array number 20, the anterior are largest, and these progressively decrease to about the 7th tooth, after which they are subequal.

Our plate is good except that the neck is shown far too exident and the nasal shields are shown in contact, whereas they are really separated by a pair of internasals. The irregularity of the pattern is well rendered, and in no two specimens will this be found quite

the same. In many specimens in life so much mud or earth adheres to the skin, that the pattern is often much, if not completely, obscured. In spirit specimens, consequently, the marking is much better seen.

ERYX JOHNI (RUSSELL).

JOHN'S EARTH SNAKE.

History.—This was first described and figured by Russell* in 1801, from an adult specimen sent to him by the Revd. John of Tranquebar. The same author figured a young example† (from a painting given to him by Captain Hardwick taken from a specimen collected in Bengal. ?)

Nomenclature.—(a) *Scientific.* The specific name was given by Russell in honour of the Missionary who presented him with the original of Plate XVI of his work.

(b) *English.*—I think John's, Earth Snake, or John's boa, the most appropriate name to apply to it.

(c) *Vernacular.*—Russell tells us on John's authority that it is called "erutaley nagam" about Tranquebar. This name, and "eruthally pamboo," both of which are Tamil, meaning "two-headed snake," are in common use in Southern India. It is also called "manooli" or "earth dweller" in the same part of India. On the Malabar Coast, and also in other parts of S. India it is sometimes called "mandalli," and in Mysore the Canarese name for it is "itallay havoo" which also means "two-headed." In Lower Bengal the Hindi name for it is "do muha" or "two mouthed," and the same application is in use in the Punjab generally. A well educated native told me that about Peshawar it is known as "landai," the Pushtu word for "short," but I am very dubious about this, believing that this name is correctly applied to either of the two little blind snakes, *Typhlops braminus*, or *Glauconia blanfordi*, both of which are very diminutive, and sometimes also called two headed snakes.

General Characters.—The snake is of remarkably even calibre in its whole length, showing little if any constriction at the neck.

* Ind. Serp., Vol. II, Plate XVI.

† Loc. Cit., Plate XVII.

The body is very stout, heavy, and muscular. Its transverse diameter very appreciably exceeds the vertical, and there is a groove along the spine. It is covered with numerous, small, smooth or nearly smooth scales. The claw-like termination of the rudimentary limb is situated as in *E. conicus*. The head is covered with scales little larger than those on the back. The broad muzzle is furnished with an angular horizontal ridge with which the creature burrows, and this ridge is more pronounced in this than in any other species of the genus. The upper jaw projects beyond the chin to an extent equal to the diameter of the eye. The eye is very small, its diameter being about one-third the length of the snout. The pupil is vertically elliptical, and the iris is spotted with ruddy gold. The nostril is slit-like, and is placed between two enlarged shields rather high on the snout. The tongue is yellowish basally, black at the tips. Beneath the chin there is a longitudinal furrow (the mental groove). The tail is short and stumpy, its extremity rounded, and general form very similar to that of the head, hence the almost universal belief among natives that the snake is two-headed. Indian jugglers, who so frequently have this snake among their stock in trade sometimes improve upon nature, and mutilate this stumpy appendage, making marks to suggest eyes, and cutting a transverse incision at the extremity which leaves a scar suggesting a mouth. The public, who for the most part prefer to keep a respectful distance from any snake, fall easy victims to their own credulity, and too often go away under the firm conviction that they have seen a head at each extremity.

Colour.—The adult specimens I have seen have been either uniformly coloured, of a lightish brown, ruddy-brown, or dark olivaceous-brown, or marked with fine dark reticulations arranged so as to form cross bars. The cross bars are ill defined, but when present at all most conspicuous posteriorly, and on the tail especially. Many specimens in life are so sullied with earth adhering to their scales, that any marks are obscured till the snake is washed. Immersion in spirit makes any marks very apparent. The belly is of a lighter shade than the back, and often more or less mottled with blackish.

The young are very different, so much so that many people who

are quite familiar with the adult fail to recognise the most juvenile specimens as of the same species. According to Russell the young one figured by him was coral red, but Dr. Annandale uses the expression brick-red for his specimens. A young specimen, about 14 inches long from Multan in our Society's collection, is sandy-red and when looked at closely the scales are seen to be pale buff with ruddy outlines forming a very fine reticulation. In Russell's specimen there is a dorsal series of large black blotches from the nape to the tip of the tail. In the Multan specimen there are broad cross-bars of a ruddy-brown hue, on the tail, and posterior body which disappear anteriorly. The belly is buff heavily dappled with darker tones.

Identification.—The snake once seen should never be mistaken, however both Europeans and Natives confuse it with *E. conicus*. As mentioned under *conicus* the genus is very easily recognised. *Johni* differs from the other species in its blunt tail. It also has a larger number of scale rows at midbody, viz., more than 53.

Dimensions.—Adults rarely exceed 3 feet. The largest I know of is in the British Museum and measures 3 feet 3 inches.

Haunts.—Like Russell's earth snake John's boa is described as a desert snake, but the remarks I have made under the former apply equally here. Father Dreckman tells me it is by no means uncommon about Khandalla in the Western Ghats (circa. 2,000 feet). He tells me further that he has always found it close to water, though not actually in that element, and that it is a very thirsty creature he having counted more than 120 gulps taken at a single drink.

It is probably much commoner than Museum specimens would make it appear, for it is one of the usual subjects of exhibition in an Indian juggler's stock in trade.

It is called an earth snake, and is frequently found beneath the soil, but how much of its life is spent beneath the ground it is impossible to know. Though the eye is small it is in other respects as perfectly developed as in Colubrine, and other snakes. This leads one to infer that the subterranean life is one that has been acquired in recent times, or that it spends part of its life above the surface soil. There is no doubt that it is frequently

encountered above ground, and I am inclined to think this is the result of its own inclination rather than from force of circumstances, such as a water logged soil in the rains, or the desire for water to assuage its thirst in long drought.

The remarks made upon Mr. John's captive specimen makes it appear that it was usually lying above the earth, and it has certainly frequently been my experience to see other caged specimens lying visible, though they were supplied with earth, in which they might have concealed themselves. It would be interesting to note in future, the climatic and other conditions when a specimen is met with either above or beneath the soil.

Habits.—I know very little of this snake in its natural haunts, so that most of my observations have been made from specimens in the hands of jugglers, or in captivity elsewhere. I always found it a particularly inoffensive creature, but thought that its gentle disposition might merely be the result of its captivity, and a reconciliation to the repeated handling it had received. However more than one good observer, who is better acquainted with the snake in nature, has remarked to me on its extremely placid nature at all times. Russell tells us that Mr. John kept one for a year in a chatty of earth. It generally lay coiled up with its head under its belly, was not easily roused, and never showed a disposition to bite. Father Dreckman, who has encountered many, tells me that he has never met with a more harmless creature, even freshly caught, he says, it never attempts to bite, and although he has handled many under natural conditions none ever used its teeth. Dr. Henderson too remarks that it is the gentlest of snakes allowing itself to be handled without any attempt at self defence. One I found in Trichinopoly lying on some loose soil, took no notice of me, allowed me to move it about with a stick without showing any signs of annoyance or attempting to escape, and was altogether so lethargic that I thought it must have been mortally damaged though I could find no trace of an injury. Those in the possession of snake men usually lie where they are placed on the ground, or make aimless movements without any attempt to conceal or bury themselves. From what has been

already said, one will readily imagine that it is a very uninteresting reptile in captivity. Perhaps its chief interest lies in the deft and speedy manner in which it can bury itself in the earth when so disposed, but one is lucky if one witnesses this performance. It noses its way into the earth, by using the transverse ridge on its snout as a digging implement. The præmaxillary bone which has to bear the strain of these operations is extraordinarily developed, surpassing in size and strength that of any other snake that I know. The only other interest attaching to the snake in the vivarium is its method of killing its prey.

Its movements are in keeping with its phlegmatic disposition, and clumsy corporeal habit. Progression is slow, and laboured and under no degree of stimulation even amounting to cruelty, does the creature seem capable of bestirring itself. The reason seems to be on account of its very narrow ventral shields and I have already remarked upon the handicapping influence these must have upon progression when dealing with the last species (*conicus*).

Food.—I have no knowledge of its tastes in a state of nature, but from the avidity with which it devours squirrels, rats and mice in captivity one may assume that it is very partial to a mammalian fare. One in Madras ate in one year 16 rats and 3 mice, another 4 squirrels, 28 rats and 4 mice, and another 17 rats. How it manages to capture such creatures under natural conditions it is difficult to understand unless as I think most probable it burrows into and invades their subterranean abodes where it can effectively bring them to bay. Once captured, it employs the same means of killing its victim as the python, encircling it, and crushing the life out of it. Its massive, and muscular body makes the accomplishment of this object an easy matter, and a speedy one. Major O. A. Smith tells me that he had one in his vivarium in company with a saw-scaled viper (*Echis carinata*). The *Echis* one day was observed to be particularly lively, and it is possible may have molested the *Eryx*. At any rate the *Eryx* wound itself round the viper's neck and constricted with such force that the viper succumbed next day to the injuries received.

Breeding.—Practically nothing is known of the breeding. We

do not even know whether it is oviparous, or viviparous though it is probably the former. The season when mating occurs, and the time of year when the young appear are similarly unknown. The smallest specimen I know of is the one mentioned by Russell, $9\frac{1}{2}$ inches long, probably a hatchling, which came from Bengal, but no date of capture is given.

Observations on the breeding habits are badly wanted, and with so common a snake, and one that thrives so well in captivity these observations should not be difficult to collect.

Sloughing.—In the Madras Museum some years ago attention was directed to this function with the following results:—One desquamated on 1-4-95, 3-5-95, 22-10-95 and 21-2-96. Another (if not the same) on 24-4-96, 28-6-96, 18-9-96 and 14-1-97. A third (if not the same specimen) on 2-8-97, 10-11-97 and 17-3-98. It thus appears to slough about four times annually at intervals varying from one to five months, and at no special season of the year.

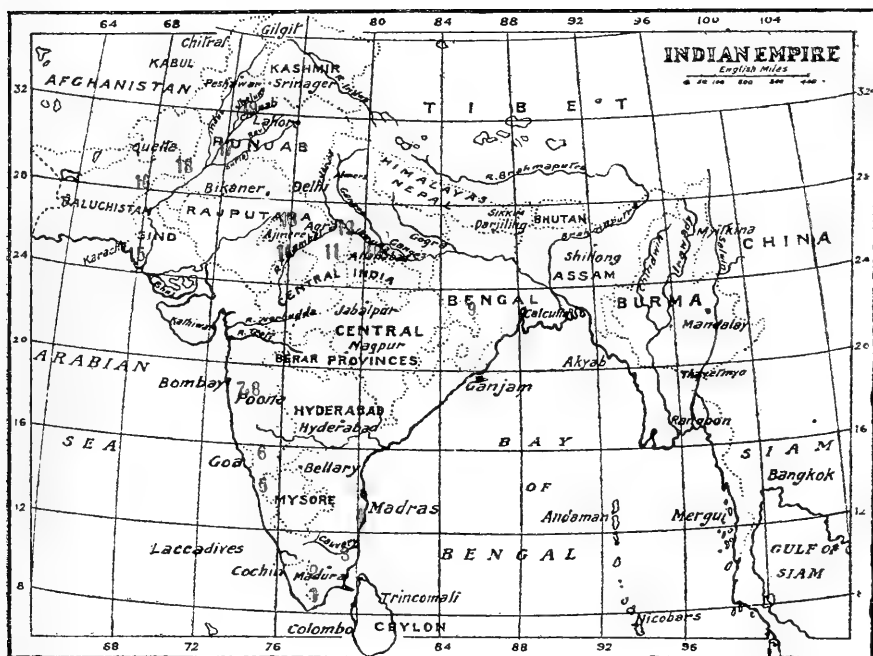
Legends.—Russell tells us that in his day the natives in Southern India declared that the bite of this snake produced leprosy. The belief is still as firm there now, even a lick from its tongue being, natives declare, sufficient to cause that terrible malady. The Rev. C. Liegh, S.J., and Dr. Henderson have both written to me to this effect. In the Punjab they say that if it once bites any one, the bitten subject will be again bitten on each succeeding anniversary of the accident by the same snake, which however is quite invisible to everyone, but its victim.

The belief that it has two heads, one at each end seems to be universal. The natives in Southern India, Lower Bengal, and the Punjab all say the same, and their names for it are founded on this assumption. In Lower Bengal and in the Punjab they say that the reptile uses each head alternately for six months. The obstinacy of the native in crediting fabulous stories of this description is most extraordinary. Even if one takes the trouble to demonstrate the true character of the tail, and a native has been prevailed upon to look attentively, he prefers to allow his imagination to override his common sense, and to discredit the evidence of his own eyes.

Distribution.—Its distribution is probably the same as *conicus*, but records of the snake are very meagre. I have lately seen specimens from Baluchistan, but this is the furthest record I am aware of in the North-West. I am doubtful if it occurs in the Ganges Valley, and there appear to be no records from Central India, the Central Provinces or Upper Bengal, but with these exceptions it is known to occur throughout Peninsula India. It has not been recorded from Ceylon. It is an inhabitant of the Plains but wanders into the lower slopes of hilly regions. In the Western Hills it has been met with at Khandalla and Belgaum (about 2,000 feet), but I do not think it occurs in the Himalayas anywhere. The specimen in the British Museum collected by Von Schlagentweit said to have come from Sikkim (9,800 feet) is discredited by Mr. Boulenger, and his doubts must be certainly shared by all Indian herpetologists.

It is possible the specimen may have been in the possession of a juggler, and I know from personal experience how untruthful these people are when questioned. In Fyzabad I interrogated a juggler about a typical monocellate cobra he had, and which he assured me he had got in the Cantonment Gardens a day or two before, but he finally confessed that the statement was untrue, and he had captured it in Bengal near Calcutta somewhere. The precise localities from which it has been recorded are shown in the accompanying map.

Lepidosis.—*Rostral*—A very large shield, with an angular transverse ridge. Touches six shields, the anterior and posterior nasals and the 1st labial. *Internasals*—Absent. *Nasals*—Two, an anterior, and a posterior, with the nostril between; the anterior meeting behind the rostral in contact with 1st and 2nd labials. Eye surrounded by small scales, one or two rows intervening between it, and the labials. *Supralabials*—10 to 13, the anterior largest, and higher than long. *Infralabials*—3 or 6, behind which a series of marginal scales borders the lip; the 1st do not meet behind the mental. A mental groove bordered by small scales. *Costals*—54 to 65 in midbody as long or rather longer than broad, except the last 3 rows which progressively increase in breadth, and are much broader than long, the last being about



DISTRIBUTION OF *ERYX JOHNI*.

I. M. implies Indian Museum, B. M., British Museum, Bo. M., Bombay Society's Collection, F. W., the Writer.

1. Ramanad (I. M). 2. Trichinopoly (F. W.). 3. Tranquebar (Russell).
4. Madras (B. M.). 5. Malabar (Dumeril et Bibron). 6. Belgaum (B. M.).
7. Khandalla (Dreckman). 8. Poona (Bo. M.). 9. Bengal (Russell). 10. Allahabad (D'Abreu *in epistola*).
11. Dholpur (F. W.). 12. Agra (I. M.). 13. Jeypore (I. M.). 14. Ajmere (I. M.). 15. Karachi (I. M. & B. M.).
16. Hanna and Duki, Baluchistan (F. W.) 17. Multan (Bo. M.). 18. Rajanpur (I. M.). 19. Pind Dadun Khan (I. M.).*

* We trust our readers will take every opportunity to send specimens of *E. johni* and *conicus* to our Society's Collection, especially from the Punjab and Bengal, to throw more light on their exact limits.

$\frac{1}{2}$ or little less than $\frac{1}{2}$ the breadth of the ventrals. Keels present in the median dorsal rows, but very obtuse. *Ventrals*—Narrow, 189 to 210. *Anal*—Trifid, the median part largest. *Subcaudals*—25 to 36, mostly entire, but many often divided.

Dentition.—In my single skull which is from a Trichinopoly specimen the teeth are as follows:—*Maxillary*—11, gradually decreasing from before backwards. *Palatine*—4, decreasing from before backwards; about as large as the maxillary. *Pterygoid*—3, subequal, well developed and about as large as the posterior maxillary. *Mandibular*—13, decreasing from before backwards.

THE GAME BIRDS OF INDIA,
BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART V.

(*Continued from page 929 of Volume XX.*)

Sub-Order—OTIDES.

The Bustards form a sub-order of birds connected with, yet distinctly separated from, many others. In general superficial appearance they are, perhaps, most like the Gallinaceous birds, more especially in regard to their heads and wings. They are, however, more closely allied in anatomy and other ways to many other families, such as the Rails, Cranes, Plovers and, in the New World, the Tinamus.

They are schizognathous and holorhinal, the cervical vertebræ are either 16 or 17 in number and the sternum has two small notches on each side of the posterior border. There is no hallux or hind toe and the two deep flexor tendons unite and again divide into three.

They possess ambiens, accessory femoro-caudal, semi-tendinosus and accessory semi-tendinosus muscles, but the femoro-caudal is absent.

There is no oil-gland and the cæca are long.

The contour feathers possess an after-shaft and there is no lateral bare tract on the side of the neck.

Family—OTIDIDÆ.

The Family of Bustards, which is the only one in the Sub-order Otides, contains birds ranging in size from that of a large partridge to birds weighing as much, or more than, 40 lbs. They are generally of sturdy build with comparatively long necks and legs, the latter very strong and furnished with three toes only. These, the toes, are remarkably broad and fleshy, but at the same time short in comparison to the size of the bird they have to support. The

claws are short and blunt. The tarsi are reticulated with small, often unequal, scales and the toes are scutellated above.

In some species the males possess a small gular pouch which is connected with an opening under the tongue.

The tail feathers vary from 16 to 20 in number in different species, and the primaries number 11, the first being of considerable length.

The young are hatched covered with down and can run about almost immediately after leaving the egg.

Otididæ, of some one or more species, inhabit the three continents of the Old World—Europe, Asia and Africa—and one species—a very close relation of our Great Indian Bustard—is also found in Australia. Some genera and species, such as *Otis tarda*, extend over a vast extent of country whilst others again, for example *Sypheotis*, are very local in their distribution.

Within Indian limits we find six species, which are generally divided into four genera, but many systematists, the late Dr. R. Bowdler-Sharpe amongst others, divide two of our genera, *Otis* and *Sypheotis*, yet again. For the purpose of these articles I, however, retain Blanford's classification and omit Sharpe's genera, *Tetrax* and *Houbaropsis*.

KEY TO GENERA.

A.—No ruff. Sexes differing in size or in breeding plumage.

(a) Top of head black.

a^1 Wing over 20" *Eupoditis*.

b^1 Wing under 16" *Sypheotis*.

(b) Top of head not black.

a^2 Tarsus more than $\frac{1}{3}$ length of wing.. *Sypheotis*.

b^2 Tarsus $\frac{1}{4}$ length of wing *Otis*.

B.—A ruff on either side of neck. Sexes alike. *Houbara*.

Genus—OTIS.

This genus is now generally divided into two, *Otis* confined to *Otis tarda* and its first cousin *Otis dybowskii* and *Tetrax* which contains only the Little Bustard, *Tetrax tetrax*. There is but little

outward difference, however, in these two genera beyond size, and I retain Blyth's classification for these Bustards and place both our birds in the one genus.

The genus *Otis* may be distinguished from the other genera of this family by the fact that the crown of the head is never black, and only very short-crested and the short, stout tarsus is only equal to $\frac{1}{4}$ of the length of the wing.

The Great Bustard, *Otis tarda*, has no seasonal change of plumage, but the male of the Small Bustard, *Otis tetrax*, has one. Again, whereas the male of *Otis tarda* is much bigger than the female, the female of *Otis tetrax* is certainly as large as the male and sometimes somewhat larger.

KEY TO SPECIES.

Wing over 15", generally between 18" and 25"... *tarda*.

Wing under 15", generally between 9" and 11"... *tetrax*.

OTIS TARDA.

The Great Bustard.

Otis tarda.—Linn. Syst. Nat. 1, p. 264; Hume, *Ibis*, 1871, p. 404; *id.*, Str. Feath. vii, p. 434; Hume and Marsh. Game Birds I, p. 1, pl.; Hume, Cat. No. 836 bis; Sharpe, Cat. B.M. xxiii, p. 284; *id.* Hand. List. B. i, p. 173; Finn, "Indian Waders" p. 116. Oates, Game-Birds, i, p. 394; *id.*, Eggs of B.M., ii, p. 84; Willoughby Verner, "My Life among the Wild Birds in Spain" pp. 131 *et seq*; Chapman and Buck, "Unexplored Spain" p. 253; Fooks, *The Field* Febr. 11, 1911.

Vernacular Name.—Deo-dagh (Chitrali.)

Description.—*Adult Male*.—General colour above sandy rufous, broadly banded across with black, the bands very strongly marked on the upper back and scapulars, less so on lower back and rump; upper tail-coverts and tail feathers light bay or vinous-chestnut, barred across with black, some of the bars broken up; the tail feathers more or less distinctly tipped with white, the outer feathers white at the base, the three outermost almost entirely white, with a broad subterminal band of black; lesser wing-coverts like the back, with black bars, less closely arranged than on the

back; remainder of wing-coverts, bastard-wing, and primary coverts white, powdered with grey towards the end of the feathers; quills brown with white bases, the primaries whity-brown with white shafts, the outer web and the tips blackish; the outer secondaries blackish, white at the base, the white increasing in extent towards the inner secondaries, which have a gradually decreasing extent of black tip till the last feathers are quite white, the innermost secondaries being sandy rufous barred with black like the back; crown of head light grey, becoming tinged with rufous on the hind neck, which has numerous narrow black transverse bars, sides or face, ear-coverts, cheeks and entire throat light grey, with elongated bristle-like feathers on each side of the chin; lower throat orange-chestnut, forming a band across the fore-neck, which is washed with light grey, the sides of the neck with numerous small bars of black; sides of upper breast sandy rufous barred with black; remainder of undersurface of body pure white.

“Bill leaden-grey, horn black at the tip; feet earthy brown, nails horny black; iris dark-brown; eyelid with white feathers.” (J. F. Naumann).

“Total length about 42 inches, culmen 2.1, wing 23.5, tail 10, tarsus 6.” (Sharpe).

Adult female.—The female differs from the male chiefly in being considerably smaller and in having no whiskers. The chestnut band on the lower throat of the male exists in the female only as patches at the sides under the shoulders of the wing.

Wing 18.25" to 20"; culmen 1.9" to 2.1"; bill from gape 2.75"; tarsus 4.5" to 5.25"; mid toe 2.25"; tail about 8".

Young.—The crown of the head like the back, which is similar to that of the females but paler and less boldly marked with black; lower throat and foreneck more or less washed with sandy buff; the white of the wings is much marked with black, the bastard wing is barred with rufous and brown and there is a certain amount of rufous on the greater wing coverts.

Nestling.—Covered with light down, mottled with black.

Colonel Willoughby Verner in his most interesting book “My Life among the Wild Birds in Spain” makes the following remarks concerning the weights of Bustards:—“The weight of a Bustard

is a subject of which very varied accounts have been written. Apparently the unfortunate stragglers which have from time to time visited England and have been promptly slain, must have been very young birds. Yarrele records males of only 16 lbs. and females of 9 lbs. to 10 lbs., whereas the males in Spain commonly weigh between 20 lbs. to 30 lbs. and the females 12 lbs. to 18 lbs. Professor Newton mentions 22 lbs. to 32 lbs. as the average weight of European Bustards. The remarkable variations of weight in birds shot out of the same flocks and in the same localities lead me to believe that Bustards take very much longer to reach maturity than is popularly imagined. Again, they seem to vary enormously in weight according to the season of the year. Out of a number of Bustards I have weighed and examined, those killed in the winter months have averaged only about two-thirds the weight of those killed in March and April. The smallest Great Bustard I ever saw killed was a young female in the month of February, and which weighed only 12 lbs. This bird must have been at least 9 months old."

"Six old male birds shot by a party of three guns, of which I was one, in the month of April averaged over 34 lbs. each, the heaviest being 37 lbs.; no doubt the contents of the crops accounted for some of this great weight."

In "Unexplored Spain" Messrs. Chapman and Buck give much the same weights. They say: "In weight, cock Bustards vary from 20 to 22 lbs. in Autumn, up to 28 to 30 lbs. in April. The biggest old males in spring reach 33 and 34 lbs., and one we presented to the National Collection at South Kensington weighed 37 lbs."

"Hen-Bustards seldom exceed 15 lbs. at any season."

Sharpe gives the range of this magnificent bird as "Southern Europe and Northern Africa, extending to Central Asia and N.-W. India" and this range now includes Persia and Afghanistan. In the latter country it was obtained by the Afghan Delimitation Commission and in the former it has now been several times taken and I have eggs also thence.

To the east of this recorded range its place is taken by a very closely allied species, *Otis dybowskii*. This species, or more

properly speaking sub-species, has no rufous breast-band in the male and in that sex there is also a band of white or greyish white formed by the median wing-coverts. The female differs from the female of *Otis tarda*, if at all, in having the head a somewhat darker grey.

In India the Great Bustard has been obtained on only four occasions; on one of these, two females having been shot, on the other three occasions single females.

It was first obtained by Hume's collectors in 1870 and Hume thus records the event:—"Once, and once, only as yet, has the Great Bustard of Europe been obtained within the limits of the British Empire in the East.

"On the 23rd of December 1870, a couple of my collectors, who were working at Mardan, under the Direction of Dr. J. A. Johnson, then of the Guides, came across a party of Bustard in some fields of mustard and giant millet, belonging to Hashtnagar and just north of the Kabul river. The birds were very shy, but my old jamadar succeeded, by driving a buffalo in front of him, in getting within shot and knocking over a female.

"This Hashtnagar is within a few miles of the very most north-westerly point of British India proper, and is in lat. 34 N. and long. 7°45' E.

"This party of Bustard did not leave the neighbourhood for some weeks, but they were so wary that, despite all the efforts of many sportsmen, Native and European, no second specimen could be obtained; and notwithstanding repeated subsequent enquiries from officers stationed at Mardan, Michni and Shabkadar, in the midst of which Hashtnagar lies, I have never been able to learn that the Great Bustard has again revisited the locality."

After this, its next record is that by Col. Fooks, I.M.S., in the columns of *The Field* of the 11th February 1911, to which article my attention was drawn by Capt. A. H. Mosse. Col. Fooks' interesting note is as follows:—

"*Great Bustard shot in India.*—The Great Bustard is a very rare visitor to India, only one specimen having been shot in December 1870. Now, after forty years, two others were shot on January 8, by a duffadar of the 15th Lancers near the place where

the first was killed. It was very cold over the north of India about Christmas, the thermometer falling to within half a degree of the record, which accounts for their presence here, and also for some Mute and Bewick's swans which have lately been seen on the Kabul river near Risalpur. In north China I once saw a large number of the European and the Great Indian Bustards on the same ground. It was interesting to note the difference between them; the latter were always scattered when feeding, and rose and flew independently like houbara, the lesser bustard, but the former did not separate so much when on the ground, and rose and flew together more like geese, although, of course, not in V formation. We do a great deal of hawking round here, especially Houbara, and it is the greatest ambition to kill one of the great European bustards with a saker falcon, but up to now no flight has been obtained of this fine species."

To this record Col. Fooks adds *in epistola*:—"The Great European Bustards were first seen here about the 20th December 1910, and migrated northwards again about the first week in February. I went after them several times to try and get a complete skin for the Bombay Natural History Museum, but was usually unable to find them when I had a gun, although I saw them several times when hawking Houbara. We flew a Goshawk at a flock (I don't know the right term) of eleven of them which we saw one day, but as the Great European Bustard keep together when on the wing, and do not separate like the Great Indian Bustard or Houbara, I rather fancy the hawk was afraid to come to close quarters, although we had a flight of about 3 miles and nearly lost the hawk. A duffadar of this regiment shot 2 females on the 6th January, they were both females and weighed $9\frac{1}{2}$ lbs. each. It is interesting to note that these were killed in the same neighbourhood as the only previously reported one was, 40 years ago. I should think that probably about 25 of these birds were seen in this district, all told. I was able to recognize them before any were shot by their mode of flight, as they always keep more or less together on the ground and rise and fly together."

The fourth specimen which has been shot within Indian limits was killed by Capt. H. M. Symonds at Jacobabad, Sind, on the

12th January 1911. As already stated this bird is a female and apparently not full grown. It is said to have weighed 5 lbs. when cleaned which would have given a weight of about 8 lbs. to the whole bird.

Finally the skin of another young female has been secured by Capt. Lyall, Chitral, and sent to the Bombay Society's Museum. This bird was shot by Lieutenant Stirling on the 30th March 1911, and Capt. Lyall in forwarding the specimen says *in epistola*:—"As far as I know the Bustard has not been recorded in Chitral, but I found that the Chitralis had got a name for the bird, 'Deo dagh,' though it is said to be a rare one."

It is interesting to note that all our records are of very young birds; a corroboration of the theory that young birds travel and migrate further than old ones.

In its general habits the Great Bustard closely resembles our Great Indian Bustard, but the few occasions on which it has been seen in India have not given much opportunity for observation, and it is on European authors, therefore, that we must rely for information.

Dresser, in "European Birds" gives the following interesting account of the habits of the Great Bustard:—"The Great Bustard frequents open, flat ground, preferring grassy plains or cultivated land, but avoiding localities near human habitations, and places where there are trees and bushes and where it cannot command an uninterrupted view over a large tract of country. It is peculiarly wary and shy; and it is almost impossible to approach it within gun shot range. Hilly country, and especially mountains, it avoids altogether, and is never met with in the woodlands and forests. It specially frequents cultivated fields, and is often found in those where rapeseed, wheat and rye have been sown. It passes the night in the open fields, choosing places where it cannot be approached without taking alarm, and is so watchful that it is impossible to surprise it when asleep. It leaves its night-quarters at the first break of dawn, and during the hot summer days will often take a siesta during the hottest part of the day, but it is then equally wary and difficult of approach. It flies with more ease than one would imagine, considering the size and weight of the

bird and has no difficulty in taking wing, at once springing up into the air without first taking a step or two, and appears to prefer taking safety in flight rather than by making use of its legs. When it flies it stretches out its neck and legs and is thus easily distinguishable Early in Spring, according to the mildness of the season, they commence to prepare for the cares of nidification; and the flocks then by degrees break up. The males fight desperately for the possession of the females, and may at that season of the year be seen strutting about, acting not unlike a Turkeycock."

As regards its flight all authors do not agree with Dresser, and some have remarked that this Bustard has to run a step or two before it can raise itself on the wing. Probably a good deal depends on the breeze, as a headwind would help the bird to get the use of his wings at once. Also, a bird suddenly startled, would use an extra effort and start into flight from where it stood, whereas a bird rising under ordinary circumstances might take matters more leisurely and run a pace or two before exerting itself to take to flight.

Col. Verner says that "The flight of the Great Bustard is extraordinarily quick and without effort. Before they take wing they simply walk for a few paces—no attempt at a run—and, opening their white wings, flap away in what appear to be a most leisurely manner. Save when there is a strong wind, or when coming off higher ground, they rarely fly more than thirty yards above the grounds, and hence, when they take the right direction, afford good driving shots. Nothing, however, is more deceptive than the pace they fly at, for owing to the steady beats of their immense pinions, some 8 ft. across, they seem to the eye to be moving slowly; but they are not.

"To appreciate the extraordinary speed they travel at it is necessary to have a bird pass close over one. More than once when lying absolutely prone on my face amid a few dead thistles a Great Bustard has passed only a few yards over my lair, at times coming from behind or from some unexpected quarter whilst all one's energies were concentrated in the direction whence the driven birds were expected. On such occasions before

one can alter one's position and rise to shoot, it has passed out of shot!"

Messrs. Chapman and Buck's description agrees well with that of Col. Verner—"Two quick steps and a spring and the broad wings of every bird in the pack flap in slowly rising motion." Later on in the book (p. 252) they add "Tardy strokes deceive the eye, and the great bulk of the Bustard accentuates the deception—it seems impossible to miss them, a fatal error."

"Yet geese with their 40 strokes fly past, ducks at 120, and the bustard's apparently leisured movement carries him in full career as fast as whirring grouse with 200 revolutions to the minute. To kill bustard treat them on the same basis as the smaller game that appears faster but is not."

In former times the Bustard was considered a great delicacy for the table, as, indeed, were many other birds which it would take a very hungry man to tackle now-a-days. As also with many other birds, recent diet has much to do with their flavour, and whilst often its flesh may be found quite palatable, at other times it may be almost uneatable. Oates says:—"The Great Bustard has a peculiar and very disagreeable smell when alive, and its flesh is not now held in much esteem. Dr. E. T. Aitchinson informs us that when he was on the Afghan Delimitation Commission, a flock of these Bustards was met with, and Lieut. Rawlins succeeded in shooting one, but the stench of the bird was so great he almost thought of leaving it; it was so dark that he scarcely knew what it was that he had got, and the scent was almost enough to put off anyone from even a new acquisition. Notwithstanding this however, we are told that the flesh was eaten next day and found excellent."

Finn, in his "Indian Waders" also comments on this curious smell of the Bustard, and suggests that, it may be this which accounts for the strange antipathy which is alleged to exist between horses and Bustards. He quotes Pallas as saying in his "Zoographia Russo-Asiatica" that horses will trample on sitting hens should they get the chance, and he adds that Bustards have got into trouble in England by attacking horses.

It is said that Bustards have been captured by being run down

on horse-back and this may be true when they are found in places where relays of horses and horsemen can take up the pursuit, otherwise it seems incredible that birds of such power of wing should be thus tired out and caught. They can certainly fly faster than any horse can gallop across country, unless for a very short distance, and if not at once put up by a fresh horse and rider and forced to fly again, would have ample time to recover before its exhausted pursuer could come to close quarters.

During the non-breeding season the Bustard is generally found in flocks (or droves, as flocks of these birds are usually termed). These droves may number anything from half a dozen to twenty birds, but, according to some authors, they are often seen together in much larger numbers than this, and Hume speaks of parties of 50 Bustards being seen together; whilst Colonel Willoughby Verner speaks to himself having seen 74 birds together in Andalusia; and Col. Irby records that "Bustards are usually found in troops varying from half a dozen birds to as many as 50 or 60 and in September we have seen 200 together." Very often these droves may break up and scatter over a large area of country when feeding, but when disturbed, leaving the ground for some other, they again unite and fly off together.

Bustards are very omnivorous, but their food undoubtedly consists mainly of grasshoppers and other insects, in addition to which they eat all sorts of grain and a good deal of green vegetable matter. When hungry or at all hard-pressed for food they will eat worms, small lizards, snakes, small mammals, such as shrews, mice, etc., and also the eggs of such other birds as deposit them on the ground. It has, like others of this family, a quaint habit of picking up and toying with any small bright object it may come across and also of swallowing the same, either by accident or design. In the same way small pebbles have often been taken from the internal arrangements of Bustards, but these are probably only swallowed as an aid to digestion. The specimen shot by Hume's collectors was found to have been feeding entirely on green mustard leaves.

The Bustard is believed by many writers never to drink and probably does so very seldom, but Finn has observed this bird

drinking when in confinement in the Zoological Gardens in London, and its not drinking may be a habit from which it departs where water is plentiful. According to Messrs. Chapman and Buck the fact that it does drink often leads to its destruction. They write:—"There is, however, one period of the year when the great bustard falls an easy prey to the clumsiest of gunners."

"During the long Andulucian summer a torrid sun has shrunk up every brook and stream that crosses the cultivated lands; the chinky, cracked mud, which in winter formed the bed of shallow lakes and lagoons, now yields no drop of moisture for birds or beasts. The larger rivers still carry their waters from sierra to sea, but an adaptive genius is required to utilise these for purposes of irrigation. All water required for the cattle is drawn up from wells; the old world lever with its bucket at one end and its counterpoise at the other has to provide for the needs of all. These wells are distributed all over the plains. As the herdsmen put the primitive contrivances into operation and swinging up bucketful after bucketful of cool water, the cattle crowd around, impatient to receive it as it rushes down the stone troughing. The thirsty animals drink their fill, splashing and wasting as much as they consume, so that a puddle is always formed about these *bebideros*. The moisture only extends a few yards, gradually diminishing, till the trickling streamlet is lost in the famishing soil.

"These moist places are a fatal trap to the bustard. Before dawn one of the farm-people will conceal himself so as to command at a short range all points of the miniature swamp. A slight hollow is dug for the purpose, having clods arranged around, between which the gun can be levelled with murderous accuracy. As day begins to dawn, the Bustard will take a flight in the direction of the well, alighting at a point some few hundred yards distant. They satisfy themselves that no enemy is about, and then, with cautious, stately step, make for their morning draught. One big bird steps on ahead of the rest; and as he cautiously draws near, he stops now and again to assure himself that all is right and that his companions are coming too—these are not in a compact body, but following at intervals of a few yards. The

leader has reached the spot where he drunk yesterday; now he finds he must go a little nearer to the well, as the streamlet has been diverted; another bird follows close; both lower their heads to drink; the gunner has them in line—at twenty paces there is no escape; the trigger is pressed, and two magnificent bustards are done to death. Should the man be provided with a second barrel (which is not usual), a third victim may be added to his morning's spoils."

Messrs. Chapman and Buck also describe a second method which the Spanish cultivators and cattlemen employ in winter. This is shooting them at night with the assistance of a dark lantern, much in the same way as in India our cultivators in many parts of the country kill deer, or as poachers in Wales spear Salmon.

To cover their movements and to lull the suspicions of the Bustards, the cattlemen carry on their wrists a cattle bell or *cencerro*, to which the Bustards are accustomed and of which they have no fear.

Many hens and young birds are also killed by so-called sportsmen during the breeding season, when the hens sit close and the young are not sufficiently advanced to seek safety in flight.

The two legitimate means of obtaining this grand game-bird are by driving and—a less sporting method—by working them in a grain cart as one shoots Black-buck in India. The latter method requires no description, for it is well known to most sportsmen in India, but the driving of Bustard requires so much special care and so much local knowledge that I again indent on Messrs. Chapman and Buck for their most interesting account of such a drive:—

"The district having been selected, it is advisable to send out the night before a trustworthy scout who will sleep at the *cortijo* and be abroad with the dawn in order to locate precisely the various *bandadas*, or troops of bustard, in the neighbourhood. The shooting party (three or four guns for choice, but in no case to exceed six) follow in the morning—riding, as a rule, to the rendezvous."

"Arrived at the *cortijo*, the scout brings in his report, and at once guns and drivers, all mounted, proceed towards the nearest of the marked *bandadas* The drivers should number

three—the centre two flush the birds, two flankers to gallop at top speed in any direction should the game diverge from the required course or attempt to break out latterally.”

“Ten minutes’ ride and we are within view of our first *bandada*, still a mile away. They may be feeding on some broad slope, resting on the crest of a ridge, or dawdling on a level plain; but wherever the game may be—whatever the strategic value of their position—at least the decision of our own tactics must be clinched at once. No long lingering with futile discussion, no hesitation, or continued spying with the glass is permissible. Such follies instil instant suspicion into the astute brains on yonder hill, and the honours of the first round pass to the enemy.”

“For this reason it is imperative to appoint one leader vested with supreme authority, and whose directions all must obey instantly and implicitly.”

“The thoughts revolving in the leader’s mind during his brief survey follow these general lines: First which is (*a*) the favourite, and (*b*) the most favourable line of flight of those bustards when disturbed; secondly, where can guns best be placed athwart that line; thirdly, how can the guns reach these points unseen? A condition precedent to success is that the firing line shall be drawn around the bustards fairly close up, yet without their knowledge. Without a halt the party ride round till out of sight. At the furthest safe advance, the guns dismount and proceed to spread themselves out—so far as possible in a semicircle—around the focal point. At 80 yards, apart each lies pressed on the earth, utilizing such shelter (if any) as may exist on the naked decline—say skeleton thistles, a tuft of wild asparagus, or on rare occasions a natural bank or tiny rain scoop.”

“Now we have placed our guns in line and within that short distance of the unsuspecting game that all but assures a certain shot. We cannot, let us confess, recall many moments in life of more tense excitement than those spent thus, lying prone on the gentle slope listening with every sense on stretch for the cries of the galloping beaters as in wild career they urge the huge birds towards a fatal course. Before us rises the curving ridge, its summit sharply defined against an azure sky—azure but empty.

Now the light air wafts to our ear the tumultuous pulsations of giant wings and five seconds later that erst empty ether is crowded with two score huge forms. What a scene—and what commotion as, realising the danger, each great bird with strong and laboured wing-stroke swerves aside. One enormous *barbon* directly overhead receives first attention; a second, full broadside, presents no more difficulty, and ere the double thuds behind have attested the result, we realize that a third, shying off from our neighbour, is also ‘our meat’.”

The Bustard breeds all over Central and Southern Europe, where there is suitable country obtainable, and in former days was often known to breed in England, especially in the South-Eastern countries. Its strongholds in Europe, however, are Spain and Central and Southern Russia. From Europe it extends to Northern Africa and through Asia Minor and Persia as far as the extreme N.-W. of India and into Afghanistan. The birds seen and recorded from Eastern Siberia and China are the nearly allied species, *dybowskii*, which is often not distinguishable from our bird.

During the courting season the male is said to display the most extravagant antics. Finn says that when courting “the male combines the extravagances of the Pouter or Fantail pigeons besides turning much of his plumage the wrong way,” to this combination he may be said to add many of the courting attitudes of the Turkey. Where there is a slight eminence, handy proceedings are usually commenced by the bird climbing up this and calling loudly until a female or females are attracted, when he descends and goes through a variety of strutting and bowing actions until he thinks he has won the heart of the coveted female. He also erects his feathers, spreads his tail and displays his wings in a trailling position and struts round his bride much as a Turkey does. These actions and the curious twisting of the feathers are most beautifully shown in a plate opposite p. 260 in “Unexplored Spain,” and this plate also shows how the general appearance becomes white during the pre-nuptial contortions and displays.

The Bustard is polygamous, but it is rather unfair to the male

to leave the matter thus; for there is no doubt that the female will accept the attentions of any male who can succeed in conquering her husband for the time being and adopting his harem. The males fight desperately during the breeding season, and are said by some observers often to seriously injure one another. This, however, hardly agrees with Col. Verner's amusing description of the fights. He writes (p. 137) "One of the most perplexing traits in the Bustard's character is that he by no means confines the period of these antics to the season of courtship. Long after the females have settled down to their eggs in the far distant corn-lands the males, congregated in big flocks, will continue to indulge in their frenzied movements, which, so far as I have ever been able to see, are purely games of "bluff" and "swagger" which never lead to more than a momentary encounter—a sort of collision and "fend off" with another bird, after which both turn about and continue their absurd movements independently. When one watches such an encounter, one can almost imagine one inverted old cock saying to another: 'You be off!' 'I won't' replies Number Two. 'What! *you won't?*' Thunders No. 1., rustling up to him with creaking primaries and a generally appalling appearance. 'No!' says No. 2, equally crackling all over and strutting around ferociously '*Then stay where you are*' remarks No. 1, wheeling about and adroitly evading the difficulties of the situation."

The nest, if such it can be called, is merely a depression in the soil either natural or scratched in loose sand or earth by the bird itself. As a rule, the site selected is in some field of grain or in scrub grass sufficiently high to conceal the sitting bird and its eggs; but sometimes it is in comparatively or quite open country, only screened from sun and enemies by a stunted bush or two or a small patch of withered grass. The hen is said to be a close sitter, once the eggs are advanced in incubation, but when newly laid she leaves them at the first signs of danger, and slinking through the cover, if there is any, takes to wing far from their vicinity.

As with other polygamous birds, the male takes no interest in the hatching of the eggs or bringing up of the chicks, and these duties are left entirely to the female.

The eggs are generally laid in May, the time merely varying according to the latitude. In its more Northern habitat no eggs will be found until well on into May, whilst many may be taken in June, on the other hand, in Northern Africa, South Russia and Asia Minor it is said sometimes to lay in the end of April, and eggs have been taken in North Africa as early as the first week of that month.

The normal clutch of eggs is generally said to be two and occasionally but one egg is incubated. On the other hand, three eggs are sometimes laid in a clutch, although this would seem to be rather rare and four and even five eggs have been taken from the same nest. There are two clutches in the British Museum, both in the Seebohm Collection, which contains three eggs, one taken at Halberstadt, Germany, on the 22nd May, and the other at Choousk-Keui, Asia Minor, on the 11th May.

Both Col. Verner and Col. Irby, however, consider 3 or 4 the normal clutch. The former says:—"It is well known to all interested in bird-life that when once a 'fact' regarding natural history has been duly recorded, it takes a long time to disprove it, successive authorities being content to quote from one another without seeking for further information. Among such is the generally accepted statement regarding the number of eggs laid by the Great Bustard which has been recorded as two from time immemorial, with the explanation that when four eggs are found in a nest 'no doubt two females have laid in it'. In consequence when I first saw a nest with four eggs I duly noted the fact and entered the usual stock explanation in my diary. By good chance my notes some years later were read by the late Lord Lilford, undoubtedly one of the best authorities on the birds of the Spanish Peninsular, who very kindly pencilled across the page: 'The Great Bustard often lays four and rarely five eggs. L.'"

"Some years later I met with a second nest with four eggs as recorded by Colonel Irby."

"After Col. Irby's book appeared, I on several occasions found Bustards' nests with three eggs, not four; sometimes considerably incubated but it was not until last year that after a long interval I chanced to be among the Bustards at the right time. In May,

1907, in one beanfield, I came across no fewer than four nests containing respectively four, three, three, and two eggs. The set of four were somewhat incubated, as were one of the sets of three, the remainder being quite fresh."

"My conclusion, based on many years' experience, is that Great Bustards commonly lay three or four eggs, but in some instances they only lay two, though in others even five eggs."

Normally the eggs of the Great European Bustard are broad eclipses in shape, rarely oval, and still more rarely with both ends somewhat pointed. Dresser, in "European Birds", gives the greatest and least dimensions of ten as 3.47" by 2.18" and 3.075" by 2.075" respectively. In his "Palæartic Birds" he gives the average as 3.22" \times 2.12".

The 26 eggs in the British Museum collection vary between 2.7" and 3.35" in length and between 2.0" and 2.4" in breadth. I have no eggs as large as the largest of Dresser's in my collection, but I have a pair from South Russia which measure only 2.65" \times 1.98" and 2.63" \times 1.99." These are unusually small, almost abnormal, though both were, I believe, fertile eggs.

The ground colour varies very much, it may be a dark-stone colour, grey stone, dull olive-grey, or olive-brown, olive-buff or even olive-brown with a tinge of yellow; nine eggs out of ten, however, will be found to be olive, either olive-brown or olive-grey, more often the former, though even this will vary considerably in depth and richness of tone. Dresser says that sometimes the ground colour may be an almost uniform dull bluish, but in the very large series I have examined lately I have seen none such. The marks consist of blotches, smudges and clouds of dull-brown of various shades and density, sometimes reddish and occasionally purplish. These are seldom very numerous and sometimes very scanty and are distributed fairly evenly over the whole surface of the egg, being but rarely any more thickly scattered over the larger end than elsewhere.

The secondary or underlying spots are of paler brown and grey, as a rule the latter colour predominating. These markings are often tinted with purple or pink and are generally less well defined than the superior markings. I have seen a few eggs which have,

in addition to the markings already described, a few streaks and lines of very deep rich brown, in one or two almost black.

The texture is rather coarse, but extremely close and hard, and most eggs carry a very fine gloss, though this varies and is sometimes practically absent.

OTIS TETRAZ.

The Little Bustard.

Otis tetraz.—Linn., Syst. Nat., i, p. 264 (1766); Jerdon, B. of I., iii, p. 625; Blyth, *Ibis*, 1867, p. 163; Beavan, *ibid*, 1868, p. 388; Blanford, East Persia, ii, p. 287; Scully, Str. F., iv, p. 184; Hume, *ibid*, vii, p. 435; Hume and Marsh. Game-B. i, p. 3; Hume Cat. No. 836; *ibid*, Str. Feath., viii, p. 111; Biddulph, *Ibis* 1881, p. 84; Scully, *ibid*, p. 586; Swinh. *ibid*, 1882, p. 119; St. John, *ibid*, 1889, p. 175; Sharpe, Yark. Miss. Aves, p. 145; Blanford, Avi. B. I., iv, p. 193; Finn, "Indian Waders" p. 118; Ward, B. N. H. S. Journal xvii, p. 945; Mitchell, *ibid*, xx, p. 1154; Verner, "My life among the Wild Birds of Spain," p. 149 *et seq.* Chapman and Buck, "Unexplored Spain," p. 262 *et seq.*

Tetraz tetraz.—Sharpe, Cat. B. M., xxiii, p. 287, *ibid*, Hand List, i, 174; Oates, Eggs of B. M., ii, p. 85; *ibid*, Game-B, i, p. 409.

Vernacular names.—Chota tilur, Obara, Punjabi; Kum-tokosi, Turki; Charaz, Baluchi.

Adult Male in breeding plumage.—General colour above sandy buff, coarsely vermiculated with black, and also showing some black blotches in the centre of the feathers; rump a little grayer than the back, the feathers being freckled with whitish instead of sandy buff; upper tail coverts white or white mottled with a few blackish markings; wing coverts like the back, but somewhat more sparsely vermiculated with black; lesser and median coverts white at the ends, and more or less freckled with black; the external coverts, bastard wing and greater coverts pure white, the inner ones slightly freckled or spotted with blackish; primary-coverts blackish, narrowly tipped with white; quills white, mostly blackish towards the ends, the tips of these feathers being again white, so that the black mark becomes subterminal; the outer primaries blackish with white bases, the white gradually increasing towards

the secondaries, which are almost entirely white with an occasional spot of black. Innermost secondaries like the back; tail-feathers coarsely freckled with black on a white ground and crossed with four distinct bars of blackish, which are very pronounced on the basal half of the tail, which is white without any blackish frecklings, the outer feathers broadly tipped with creamy white; crown of head, nape and hind neck brown, mottled with streaks and edgings of sandy buff, with a few blue-grey feathers intermixed; lores and sides of crown pale and sandy buff, streaked with dark brown; feathers above and round the eye uniform creamy buff; sides of face, ear-coverts, cheeks and throat light bluish grey, which is bordered by a broad band of black extending from the sides of the hind neck diagonally across the latter and uniting in a broad band which runs down the centre of the lower throat; around the hind neck and occupying the sides of the latter is a broad extent of black which unites on the upper foreneck; this is bordered above by a broad band of white which encircles the hind neck, separates the black on the sides of the neck, and descending on the latter to the lower throat, unites there in a point; across the lower foreneck a broad black band, which is separated from the lower throat by a band of white which traverses the foreneck also; remainder of undersurface pure white; sites of the upper breast sandy-coloured and mottled with black like the upper parts; underwing coverts, axillaries and quill-lining pure white.

Adult Female.—Whole upper surface rich buff or rufous buff, vermiculated with black and with black central lines here and there widening into blotches; on the hind neck the markings are very fine and the buff replaced by brown; the black markings on the crown form irregular bars; lesser wing coverts like the back but less profusely marked with black, median coverts the same but with still less black and with the buff becoming almost white at the tips, greater coverts white with dark brown or blackish shaft streaks and with a few scattered specks and spots of black which become regular subterminal bars on the innermost; primaries dark brown mottled with white at the tips and with white bases, concealed on the outermost but increasing in extent until the innermost are nearly all white, outer secondaries white, with

specks and bars of black at wide intervals, inner secondaries like the back. Chin and upper throat dull buff or brownish white, the underneck the same streaked with black and buff sides of head like throat but streaked finely with black; lower throat and breast dull pale buff, the former streaked and the latter barred with black. The centre of the breast is generally nearly white, as is the lower breast, and the bars are wider apart. Under the wing the buff extends down the breast for some two or more inches; remainder of underparts, flanks and underwing coverts white; some of the feathers of the flanks with black shafts and here and there a black spot.

Male in Winter.—Resembles the female but the vermiculations are finer and the black markings less bold. The black crescentic marks on the lower breast are also less defined and regular.

Young.—"General distinguishable from the adult by the greater amount of barring on the chest, by the more profuse barring on the upper tail-coverts and the sandy frecklings of the primary coverts." (Sharpe).

In this species, unlike *Otis tarda*, there is little difference in size between the sexes, and whereas in that bird the male greatly exceeds the female, in this the male, though it averages heavier and a little bigger, is not apparently so. Hume says in regard to Indian birds, "I do not find the sexes differ materially, although the males unquestionably average rather larger and are perceptibly heavier."

"The following are dimensions, etc., recorded of Indian specimens:—Length 17 to 19 inches; expanse 33·5 to 36; wing 9·5 to 10·1; tail 4 to 5; tarsus 2·2 to 2·66; bill from gape 1·5 to 1·6; weight 1·5 to 2 lbs."

"The colours of the soft parts vary a good deal; the legs and feet are yellow, dusky yellow, greenish yellow, the feet often browner and dingier; the bill is blackish, greenish black, dusky horny or brown, generally paler on culmen, and bluish grey, greenish or yellowish at the base and the irides vary from light yellow to orange."

J. F. Naumann says the irides of the young are brownish yellow.

Sharpe notes some curious measurements in the Catalogue, he

gives the culmen of the male as 1·5" and that of the female 1·1" but the wing of the male as averaging 9·4" whilst that of the female is 9·7".

Blanford thus defines the distribution of the Little Bustard "Southern Europe, Northern Africa and Central Asia, including Afghanistan and Yarkand. A few birds occur in Gilgit, and this species is a regular winter visitant to the extreme North-Western Punjab near Peshawar. A few stragglers are found occasionally east of the Indus and the species has been recorded from Gurdaspur and even from Saharanpur."

Hume, as usual, gives a good and detailed account of the habitat of *Otis tetrax*, both in reference to its whole range and its occurrences within Indian limits. He writes:—"The Butterfly Houbara, as Indian sportsmen in the North-West have not inappropriately designated the Little Bustard of Europe, is a regular and tolerably abundant winter visitant to the northern portions of the Trans-Indus Punjab.

"Cis-Indus, they can only be considered rare and occasional stragglers. In December 1878, Col. Macleod, R.A., shot a fine male of this species near Gurdaspur, and about the same time Mr. O. Greig shot a female at Balawala on the bank above the Ganges Kadar in the Saharanpur district; and, others must doubtless have occurred in the submontane tracts of the Punjab and North-Western Provinces; these are, I believe, the only instances on record of their being brought to bag."

"Out of India, the Little Bustard is common in suitable localities in Southern Europe and Northern Africa, adjoining the basin of the Mediterranean. It straggles to Northern Europe, even to the British Isles and Sweden. It occurs, and very numerous, in some places, in Syria, Asia Minor, the Caucasus, Northern Persia, Kabul and Northern Baluchistan, and throughout the tract of country lying between the Caspian and Western Yarkand, whence we have specimens from Yangihissar, Kashgar and other places in the plains between these and Sanju."

"It does not appear to go north across the Tian Shan, or eastwards into Mongolia or China; neither Radde, Przevalski nor David include it in their lists."

A remarkable extension to this birds range is made by records of three birds obtained in Kashmir. The first of these refers to one obtained by Col. A. E. Ward near Hajan, Kashmir, in December 1906, and recorded in Vol. XVII of the Journal of the Bombay Natural History Society; the other two are recorded by Mr. F. J. Mitchell in Vol. XX of the same journal. Of these two latter one was shot by Major Brown during a duck drive on the Hooka Sar Jhil in 1910 and the second by Major Smith near the Woolar Lake in early 1911.

The Little Bustard is, of course, only a cold weather visitant to India, arriving early in October and leaving in March, occasionally staying as late as the first week or two in April. These dates are very rough but there is a curious absence of all records as to this bird's appearance and disappearance from Indian limits and an almost equal lack of accounts of its ever being shot or hawked.

One of the best general accounts of this bird's habits, &c., is that given by Seebohm and quoted by Oates on pp. 410-411 of "Game Birds." Seebohm writes as follows: "It is a partial migrant, arriving at its breeding grounds in flocks early in April, which are dispersed in May. It is so much less than the Great Bustard, that by the middle of May the grass and the flowers hide it completely from view. The females sit very close and are difficult to find, but the males betray themselves by their curious notes. As you drive slowly across the steppes, your attention is arrested by a distant cry, resembling the sound of the syllable spurtz. By following with the wagon in the direction whence it proceeds for a hundred yards or more, you may generally put up the bird, frequently within shot, but if followed on foot there is little or no chance of securing it. The flight is quite different to that of the Great Bustard, more resembling that of the partridge than that of a heron. The wings are moved with great rapidity and the flight is very straight, though not very slow. The beats of the wing are so rapid that they make quite a loud whirring sound, and they shew more white when flying than the Great Bustard does. In many respects their flight resembles that of a butterfly or of a Snow-Bunting. We never saw two males together during the breeding season. The nest can only be found

by accident. We were driving rather quickly across the steppe, anxious to reach Kalarath before dark, when suddenly a female Little Bustard rose within ten feet of the wagon and was speedily dropped by our Jager, who was sitting gun in hand by the driver. We jumped out of the carriage, and in a quarter of a minute found the nest, containing four eggs. The hollow was deeper than that of the nest of the Great Bustard, and there was a distinct nest of dry grass and weeds, though very slight; it was about seven inches across and well concealed by tufts of a kind of lucerne."

Mr. M. M. L. Currie has sent me the following interesting note upon the occurrence of the Lesser Bustard in Ludhiana:—"Bustard, *i. e.*, the Lesser Bustard or Obara, commonly called 'Tilur' in the Punjab was pretty common in the Dhera Ghazi Khan where I shot a certain number in the cold weather of 1908-09. They were most common in the dry tract at the foot of the Sulimans where they seemed to be especially fond of lying up on a kind of short coarse grass locally known as 'Ghamn.' Later in the year they haunt the fields sown with oil-seeds (*faramira*). I have also occasionally seen them down on the low lands near the Indus. The usual number seen together was three or four, but once or twice I have seen as many as a dozen together. The method of shooting most often employed is with camels. The sportsman dismounts and taking cover behind the camel continues to approach in circles till within range when he advances towards the spot where the bird is lying till he puts it up.

"The best bag I ever saw made in this manner was by a companion of mine who got six birds one day whilst I, not so fortunate, shot but one. It is said to be possible at times to walk them up in the oil-seeds, but I never did so with any success."

The Lesser Bustard is capable of straight, strong flight but often indulges in most curious vagaries when on the wing, rising to a great height and then twisting and twirling about in an indefinite kind of manner until it makes up its mind to go straight away. Some of my correspondents, however, who have met with this bird principally in grain and mustard fields, which offer good cover, describe it as lying very close, easy to walk up and easy to kill when once flushed. They describe the flight as being much like

that of a Partridge, though perhaps not so fast, and the bird is said to get up with a good deal of fluster of wings but once up to "get into its stride" and away at once. Others who have pursued this Bustard in more open plains describe the bird as shy and difficult to approach, rising far out of shot, but as being a poor, weak flier with a "flip, flap sidelong action" looking as if the bird could not make up its mind where to go.

Colonel Willoughby Verner in "My life among the Wild Birds of Spain" says "Their flight is effected by extremely rapid beats of the wing, noticeable even at great distances, owing to the flashing of the sunlight on the white portions. The noise produced by their quick motion is one which once heard can never be forgotten and can be likened to a quick sibilant sound of 'see-see-see-see' suggestive of that produced by the steam of a railway engine as it gathers way."

Messrs. Chapman and Buck, in commenting on the impossibility of driving the Little Bustard, write "You cannot diagnose beforehand his probable line of flight, for he has none, nor can you influence its subsequent direction. For the little bustard shuts off all negotiation at its initiation by springing vertically in air, soaring far above gunshot, and there indulging in fantastic ærial evolutions more in the style of a wigeon or other wild-fowl than of a true game-bird as he is. Thus from that celestial altitude he spies out the country and all terrestrial dangers, finally disappearing afar amidst the waste of atmospheric space. Frequently we have noticed the high-flying band, after, say, twenty minutes of such display of wing-power, descend directly to their original position at a safe interval after the drivers had passed forward thereof!"

Hume says that "At times, especially early and late, they are very wary, but at other times, chiefly, I think, when the sun is high and hot, they will lie as close as a Button Quail."

"They are often shot, bags of ten or a dozen couple having been reported; but it is chiefly as a quarry for falcons that they are esteemed, and in the neighbourhood of Mardan, hawking with the Saker or Chargh Falcon used to be a standing amusement.

"They are broad-breasted, compact, strong birds but withal easily killed though perhaps less so than the Florican."

The food of this Little Bustard is as varied as that of its big cousin, and though it lives principally on grain and green food it will devour anything in the insect line, and also slugs, snails, worms, and even small lizards, frogs, etc.

As an article for the table, opinions differ greatly, but whilst many consider it a delicacy, few condemn it altogether, and it certainly ranks as food not to be despised when once it has been shot. Messrs. Chapman and Buck declares "its flesh to be both delicate and delicious."

Dresser says that during the breeding season the male has a harsh cry which may be syllablized as *trec, trece*, and which can be heard from a great distance, and Col. Willoughby Verner says that when alarmed "it utters a loud guttural rattling cry, somewhat similar to that of a grouse calling in early morning and even more like that given by the Bustard which we came across on the veldt between the Orange and Modder Rivers during the eventful days of November 1899."

The Lesser Bustard, like other birds of the family, is generally considered to be polygamous, and constant fighting between the males goes on throughout the breeding season for the females, who appear to be indifferent to what male takes them as long as they have a husband of some kind---Messrs. Chapman and Buck, however, disagreeing with the above write: "They are strictly monogamous, yet the males 'shew off' in the same fantastic way as great Bustard and Blackcock."

In the more Northern parts of its breeding range the eggs of the Lesser Bustard are laid late in May and early in June, but further South most will be found in the first fortnight of May and some in the end of April.

I have eggs from East Prussia, dated 26th June, and another clutch from Italy, dated 13th April.

Their breeding habits and nidification, if such it can be called, seem to closely resemble those of the Great Bustard. There is no nest, though sometimes the depression which contains the eggs may be more or less filled up with grass and weeds, and the

constant lying on this may have formed it into a hollow cup. They select, or themselves make this depression, either in standing crops of grain or mustard or under shelter of a bush or patch of grass in an open plain and the hen sits very close when once incubation has begun.

Col. Verner thus describes the nests of the Little Bustard: "Few nests are more difficult to find than the Little Bustards', especially when they are amid the rank herbage on the fallow lands or the asphodel, when they are as well concealed as a Partridge's or Quail's. They are almost equally baffling when on the plains amongst the thousands of acres of waving reeds, 2 ft. or 3 ft. in height, which permit of the old bird running for an indefinite distance from the nest before taking wing. The same remark applies to those placed amongst the standing corn."

"The nest varies much in its size and construction, being at times a well compacted mass of dried grasses and herbage and in others little more than a chance collection of debris. Where a nest is well concealed, the female will sit very close and not betray its situation until almost trodden upon, whereas in more exposed situations she usually slips off and, crouching, runs some distance before taking wing."

"The nest here shewn was amidst a dense growth of coarse herbage, in which ox-eye daisies and dandelions predominated. The bird only left when I was within 2 ft. of her and in her scuffle and alarm drove a claw through one of the eggs. To get a photograph of this nest, we had to clear away much of the surrounding herbage. The nest was only a slight depression measuring 8 in. across and was lined with grasses and herbs pressed down around it."

"The day I found this nest with two eggs was dull and wet with heavy gusts of wind ... It was 18th May and, ... a few hours later on the very same day I came across a second nest about three miles from the first one. It would be hard to imagine a greater contrast than it presented, for it was on a bare and open hill-side, fallow ground with practically no cover on it save that afforded by some scattered patches of rank herbage. The nest was constructed in one of these patches and was quite open to view to any

passer by as can be seen from the picture. The cup of the nest was much deeper and better finished than the cup of the first one, being well lined with grasses. The adroitness of the Little Bustard is shewn by the fact that despite the open nature of the ground around this nest and of my keeping a sharp look out, we never saw her leave it and she took wing from a point just 23 yards (measured) from one side of it."

The number of eggs is generally four, but five eggs have been taken in the same clutch and three are often found whilst sometimes only two have been incubated.

Aksakoof, as quoted by Dresser, gives the number of eggs laid as from 8 to 12, but this, of course, is incorrect and is probably due to a mistake of some kind, as even clutches of five eggs are exceedingly rare.

Oates, in his British Museum Catalogue of eggs, thus describes the eggs of *Otis tetrao*: "The eggs of the Little Bustard are of a short pointed oval form, frequently elliptical and sometimes spheroidal. They are highly glossy. The ground is dark olive-green or olive-brown, and occasionally of a buff colour, and this is marked with streaks, clouds and blotches of very pale reddish brown or yellowish brown. The underlying markings are hardly separable from the ground colour. Many specimens are marked so faintly that they appear to be quite plain coloured; but when closely examined the markings can always be made out. The eggs measure from 1.92 to 2.23 in length and from 1.43 to 1.6 in breadth."

In addition to the ground colours mentioned above I have one clutch which is a pale french grey with the markings very pronounced and dense, and two others again which might be termed olive-blue upon which the markings, though faint, contrast well and distinctly.

I have no eggs of the shape Oates describes as "short, pointed oval," mine all being spheroidal, or nearly so.

The texture is much finer and closer than that of the egg of the Great Bustard and is more consistently highly glossed.

My eggs average 1.92" \times 1.44" and Dresser gives the average of his eggs as 1.95" \times 1.45".

NOTES ON BUTTERFLIES FROM THE NAGA HILLS.

BY

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(With Plate A.)

PART I.

The only account of butterflies from the Naga Hills, as far as I am aware, is that by Mr. H. J. Elwes, P. Z. S., 1891, p. 249, and 1892, p. 647; in these notes Mr. Elwes gives a list of the rarer and more interesting butterflies collected in the years 1889 and 1890 by Mr. Doherty in the Naga and Karen Hills and in Perak and also a few in the Assam valley.

In these notes I have included all the commoner butterflies most of which were probably taken by Mr. Doherty, but not mentioned by Mr. Elwes, and also a few not found by him; this is by no means a complete list and no doubt many other forms will turn up especially amongst the *Lycænidae* and *Hesperiidæ*.

As far as possible I have given exact dates, localities and altitudes where the insects were captured and hope this will assist future collectors when working these interesting hills.

Since Mr. Doherty visited these hills the Assam Bengal Railway has been built and passes within a march of Nichuguard on the frontier, and so access to these hills is now very much easier.

The area collected over by myself and my collectors consists of—

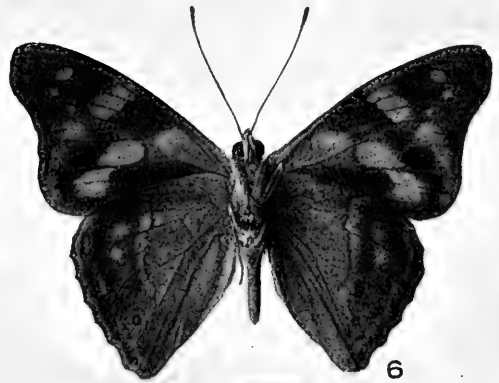
(1) The low country at the foot of the hills between Nichuguard, about 700 ft. and Gaspani, 1,700 ft.; this consists almost entirely of fine forest and is excellent collecting ground.

(2) The country close to Kohima from 3,000 ft. to 5,000 ft., here the hillsides are extensively cultivated and what little forest there is is of recent growth, consequently good butterflies are not plentiful.

(3) The country above the cart road between Kohima and Maothana, on the Manipur frontier, from 5,000 ft. to 7,000 ft.; this is grand collecting ground, the hills are steep and covered with thick virgin forest.

EXPLANATION OF PLATE A.

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| Fig. 1. | <i>Lethe brisandra</i> , <i>de N.</i> | ♂ |
| .. 2. | , .. " | ♀ |
| .. 3. | .. <i>dinarbas</i> , <i>Hewitson</i> | ♂ |
| .. 4. | " .. " | ♀ |
| .. 5. | <i>Apatura florenciæ</i> , <i>n. sp.</i> | ♂ upperside. |
| .. 6. | " .. " | ♂ underside. |
| .. 7. | <i>Cyllogenes janetæ</i> , <i>de N.</i> | ♀ |





(4) A few specimens were also obtained at Tamlu, at the Northern extremity of the Naga Hills, and given to me very kindly by Capt. Bliss.

FAMILY—NYMPHALIDÆ.

Sub-family—DANAINÆ.

1. *Danaïx plexippus*, L.—Occurs from the foot of the hills up to 5,000 ft. throughout the year.

2. *Danaïx chrysippus*, L.—A few specimens obtained at the foot of the hills in January and February.

3. *Danaïx tytia*, Gray.—Common near Kohima from August to October, one specimen obtained at the foot of the hills in February.

4. *Danaïx melanea*, Cramer.—Not common, a few specimens obtained near Kohima from August to October.

5. *Danaïx limniace*, Cramer.—Not very common, specimens were obtained at the foot of the hills in November and at Kohima from April to August.

6. *Danaïx septentrionis*, Butler.—Occurs commonly near Kohima from August to November, a few specimens were obtained at the foot of the hills in January and February.

7. *Danaïx melanoides*, Moore.—Common at the foot of the hills in February and March, and in the vicinity of Kohima from August to November.

8. *Euplœa hopei*, Felder.—Taken at the foot of the hills in March and October and near Kohima in April and May; in the latter month it is very common.

9. *Euplœa alcatheæ*, Godart.—Not common, taken at the foot of the hills in February, April, July and November.

10. *Euplœa dione*, Westwood.—I have not obtained this butterfly but it is included in Mr. J. L. Sherwill's list of butterflies from the Naga Hills.

11. *Euplœa diocletiana*, Fabr.—A common butterfly, taken at low elevations throughout the year; females are rare.

12. *Euplœa klugii*, Moore.—Two specimens of the form *indigofera*, Moore, were obtained at the foot of the hills in May.

13. *Euplœa splendens*, Butler.—Not common, taken at low elevations in January, May, August and November and a single specimen at 5,000 ft. in November.

14. *Euplœa mulciber*, Cramer.—An extremely common butterfly throughout the year from the foot of the hills up to 6,000 ft.

Sub-family—SATYRINÆ.

15. *Mycalesis anaxias*, Hewitson.—Mr. Moore records this from the Naga Hills but I have not yet obtained it.

16. *Mycalesis sanatana*, Moore.—A few wet season forms were obtained in May, October and November, and a single dry season form in May all at about 5,000 ft.

17. *Mycalesis charaka*, Moore.—Mr. Moore records this species from the Naga Hills.

18. *Mycalesis orseis*, Hewitson.—Recorded from the Naga Hills, but I have not met with it yet.

19. *Mycalesis mineus*, Linn.—Dry season forms were obtained at the foot of the hills in February and at Kohima commonly in October and November. Wet seasons forms occurred commonly at Kohima from August to October.

20. *Mycalesis visala*, Moore.—Two wet season forms were obtained at the foot of the hills in May and dry season forms at 2,000 ft. to 5,000 ft. in October and November.

21. *Mycalesis malsarida*, Butler.—Recorded from the Naga Hills but I have not met with it.

22. *Mycalesis malsara*, Moore.—A single dry season form was obtained at Phiphima, 4,000 ft. in February.

23. *Mycalesis lepcha*, Moore.—Dry season forms obtained at Gaspani, 2,000 ft. and at Kohima in March and April, and wet season forms at Kohima in August and October.

24. *Mycalesis nicotia*, Hewitson.—A single male, wet season form, was obtained at Kohima in August.

25. *Orsotriæna meda*, Fabr.—A single male taken at 5,000 ft.

26. *Lethe rohria*, Fabr.—Males common at Kohima and at the foot of the hills, April to November. Females rare.

27. *Lethe dinarbas*, Hewitson.—Pl. A, figs. 3 ♂, 4 ♀. Three males and three females taken at 7,000 ft. in September and a male at 6,000 ft. in October.

28. *Lethe brisanda*, de N.—Pl. A, figs. 1 ♂, 2 ♀. Three males and a female at 7,000 ft. and two males at 5,500 ft. taken in September and November. Bingham considers that *L. dinarbas* and *L. brisanda* to be merely races of *L. insana*. I however consider that *L. brisanda* is specifically distinct from *L. dinarbas*; the differences are clearly shewn in the figures on plate A. Both these forms, i.e., *brisanda* and *dinarbas* fly together and I do not consider it possible for races of one species to do this.

The female taken is very different to the form figured in Moore's Lep. Ind. vol. 1, pl. 85, fig. 3 (a), but I have no doubt that I have identified it correctly as the characteristic markings are the same as in the male. In Moore's figure they certainly are not. Mr. Heron who kindly examined it for me is also of the opinion that it is the female of *L. brisanda*.

I give a description of it as it does not agree with de Nicéville's original description. *Upperside*, as in male but paler, the discal band on forewing

slightly broader and paler, beyond it three of the subapical ocelli of the underside shew through as black spots on a pale ground of the same colour as the discal band; above these spots inclined inwards are two pale brown diffuse spots in interspaces 6 and 7, the upper one minute. Hindwing with all the spots more conspicuous than in the male, those in interspaces 2 and 3 centred with white and distinctly encircled with yellowish brown, that in interspace 4 indistinctly encircled with the same colour and with no white pupil, those in interspaces 5 and 6 diffuse and blind and not encircled with an outer ring. The geminate spot in interspace 1 on the underside does not show through.

Underside as in male but paler; forewing, the discal band a little more curved, broader and paler; the area between it and the submarginal lines near the tornal angle yellowish brown; above which are four submarginal spots placed on a lilacine ground in interspaces 3, 4, 5 and 6; the lower three being black with white pupils, encircled with yellow and a narrow outer ring of darker colour; the upper spot lilacine with a dark outer ring. Hindwing as in male but lighter and the yellow rings round the ocelli brighter.

The male and female can at once be distinguished from the same sexes of *Lethe dinarbas* as follows:—

(1) In *L. brisanda* the discal band is directed towards a point on the dorsum short of the tornal angle, whereas in *L. dinarbas* it is directed either towards the tornal angle, or to a point on the termen above it.

(2) The submarginal spots on the underside of the forewing in *L. brisanda* are four, in *L. dinarbas* three.

(3) The termen of the hindwing at vein 4 in *L. brisanda* is prolonged into a more distinct tooth than in *L. dinarbas* and gives the wing a different appearance.

In addition to the above differences the female of *L. brisanda* has the discal band narrow, pale-brown and curved, the female of *L. dinarbas* has it broad pure white and straight.

29. ***Lethe confusa*, *Aurivillius*.**—The wet season form is common at Kohima from July to October and the dry season form which appears to be undescribed was taken commonly from the foot of the hills up to 3,000 feet in February and April.

Description of the dry season form.—

Upperside: the same as in the wet season form except that on the hindwing the submarginal ocelli are more conspicuous and in some specimens distinctly ringed with yellow. *Underside*: differs from the wet season form as follows: the ground colour between the discal band and the apex of the forewing and also that on the anterior sides of the discal and discoidal bands rich chocolate brown, this colour filling the apex of the cell; the rest of the wing grey brown; the submarginal spots are partially

ringed with whitish or ochreous lilacine and not with bright lilacine as in the wet season form; the areas between the upper two spots and the termen whitish and diffuse. Hindwing, the discoidal band anteriorly and the discal band posteriorly bordered with rich chocolate brown, the latter band more angled at its middle than in the wet season form; the areas between the discal and discoidal bands and the basal area extending to the tornus rich grey and the area between the submarginal spots and the submarginal line pale chocolate brown; the submarginal ocelli are more elongated than in the wet season form especially the apical one and the second from the bottom, all the ocelli except the upper one, which is blind, have the pupils more or less disintegrated. Each ocellus separately ringed with whitish lilacine and not enclosed in a common bright lilacine band as in the wet season form; the marginal and submarginal lines are quite distinct, of equal width and yellowish, the submarginal tinged with lilacine. In size the dry season form averages larger than the wet season form.

The dry season form may at once be recognised by the underside, the ground colour of which is dark chocolate and grey crossed by ochreous lilacine bands, in the wet season form the ground colour is uniformly dull brown with all the markings bright lilacine.

30. *Lethe verma*, Kollar.—Very common from 5,000 feet to 7,000 feet July to November.

31. *Lethe sidonis*, Hewitson.—Males very common, females rather rare at 5,000 to 7,000 feet. Wet season forms were obtained from July to October and large dry season forms in October, the latter do not agree with Moore's figure or description, they are of a much lighter brown than the wet season form on both surfaces; on the underside of the hindwing the 2nd, 3rd and 4th ocelli from the top only have blurred lilacine centres; two intermediate forms were also taken in September and October, both are of the same size as the wet season form but are as pale as the dry season form; in one form the ocelli of the hindwing resemble the rainy season form and in the other they resemble the dry season form.

32. *Lethe siderea*, Marshall.—A single male of this rare butterfly was obtained on 21st September near Kohima at 6,500 feet.

33. *Lethe scanda*, Moore.—Males not uncommon at 7,000 feet, I did not obtain the female.

34. *Lethe bhairava*, Moore.—A few specimens of both sexes were obtained at 7,000 feet in September; from October to December the males are fairly common, the females less so.

35. *Lethe guinihal*, de N.—A single male was obtained at Gaspani, 1,700 feet in July.

36. *Lethe latiaris*, Hewitson.—Occurs not uncommonly at 5,000–7,000 feet in September and October. Specimens of both sexes were captured in my garden at Kohima.

37. *Lethe kansa*, Moore.—Occurs at the foot of the hills from May to August.
38. *Lethe vindhya*, Felder.—Three males of the wet season form taken at the foot of the hills in June and July.
39. *Lethe serbonis*, Hewitson.—Rather rare. A few males obtained between 6,000 and 7,000 feet in September.
40. *Lethe sinori*, Hewitson.—Three males obtained at 5,000 feet in July and October and a female in November.
41. *Lethe chandica*, Moore.—Not uncommon. Males obtained at the foot of the hills and at about 1,700 feet from February to November.
42. *Lethe mekara*, Moore.—A male taken in May at the foot of the hills and a female in November at Gaspani, 1,700 feet.
43. *Lethe goalpara*, Moore.—A pair obtained at 7,000 feet in September.
44. *Lethe sura*, Doubleday.—A very common butterfly from July to November. During September and October many males but only two females were taken; in November, however, females predominated, fourteen females being taken and only two males.
45. *Lethe khasiana*, Moore.—Two males taken by Mr. Doherty.
46. *Lethe pulahoides*, Moore.—Not uncommon at 5,000—6,000 feet in August and September.
47. *Lethe yamoides*, Moore.—Recorded from the Naga Hills, but I have not met with it.
48. *Zipetis scylax*, Hewitson.—Recorded from the Naga Hills.
49. *Orinoma damaris*, Gray.—Not common, a few specimens taken at 5,000 feet in September and October.
- . *Rhaphicera satricus*, Doubleday.—A single male obtained at 6,000 feet in September.
51. *Aulocera loha*, Doherty.—Two females of an *aulocera* thought by Mr. Elwes to belong to this species were obtained by Mr. Doherty at 8,000 feet in August near Mao on the Manipur frontier of the Naga Hills.
52. *Ypthima baldus*, Fabr.—Common. Dry season forms were obtained in February and Wet season forms in August at 4,600 feet.
53. *Ypthima affectata*, Elwes and Edwards.—Two males and a female were taken at 2,000 feet in February.
54. *Ypthima austeni*, Moore.—Three males and one female obtained at Kohima, August to October.
55. *Ypthima methora*, Hewitson.—Recorded from the Naga Hills.
56. *Ypthima newara*?, Moore.—Not uncommon at Kohima from August to October. Specimens obtained are much smaller than the measurements given by Moore and Bingham, the smallest being 1.46 in expanse and the largest 1.64; the colour of the underside is not so yellow as in a specimen I have from Bhutan. It agrees more with the description of *Y. lycus*, de N., but the basal area does not appear to be darker than the rest of the wing,

57. *Vythima avanta*, Moore.—A few specimens obtained at Kohima and at the foot of the hills in January and February.

58. *Vythima huebneri*, Kirby.—A male obtained at the foot of the hills in February and another at Kohima during the same month; the former agrees with specimens in my collection from Barrackpore, but the latter differs in being much paler and in having the forewings more pointed.

59. *Erebia orixa*, Moore.—Fairly common on grass slopes, 6,000—7,000 feet in September and October.

60. *Melanitis ismene*, Cramer.—Wet season forms taken commonly at Kohima in August and September, and dry season forms from September to November. A few specimens also obtained at the foot of the hills in August and November.

61. *Melanitis bela*, Moore.—Fairly common from the foot of the hills up to 6,000 feet. Dry season forms obtained from February to May and again from August to December and wet season forms in August.

62. *Cyllogenes janetæ*, de N.—Pl. A.; fig 7, ♀. A single female of this rare form obtained at 6,000 feet in September. Mr. Doherty secured a male.

63. *Anadebis himachala*, Moore.—Taken not uncommonly at low elevations from July to October.

64. *Neorina hilda*, Westwood.—A few specimens obtained at 6,500 ft. in September; Naga Hill specimens seem to be smaller than Bhutan specimens, being only 3.5 inches in expanse; the yellow discal band on the forewing is also paler and of a slightly different tint.

65. *Elymnias undularis*, Drury.—Common at the foot of the hills from February to November.

66. *Elymnias malelas*, Hewitson.—A few males taken at low elevations in May, July and August.

67. *Elymnias patna*, Westwood.—Males obtained at low elevations in July and August.

68. *Elymnias vasudeva*, Moore.—A single male taken at Gaspani, 1,700 ft., in March.

Sub-family—MORPHINÆ.

69. *Clerome arcesilaus*, Fabr.—Recorded from the Naga Hills but not met with by me.

70. *Amathusia amythaon*, Doubleday.—Recorded from the Naga Hills.

71. *Thaumantis diores*, Westwood.—Two males taken at low elevations in May and November.

72. *Æmona amathusia*, Hewitson.—Recorded from the Naga Hills but must be very rare.

73. *Enispe enthyimius*, Doubleday.—Two males of the variety *tessellata* Moore, were obtained at 2,000 ft. in February and March.

74. *Enispe cynus*, *Westwood*.—Several males and two females of this beautiful butterfly were obtained at 6,000 ft. during September and October; they are fond of flying up and down narrow jungle paths and are difficult to catch as the thick jungle prevents the net being handled efficiently.

74a. *Discophora tullia*, *Cramer*.—Common at low elevations from March to October.

Sub-family—Nymphalinae.

75. *Charaxes marmax*, *Westwood*.—Taken at the foot of the hills in March, April and August.

76. *Charaxes kahruha*, *Moore*.—Two males taken at Tamlu and Gaspani in August and October.

77. *Charaxes aristogiton*, *Felder*.—Five males obtained at the foot of the hills in April and October.

78. *Charaxes hierax*, *Felder*.—I have not taken typical *hierax* in these hills but it will probably occur; I follow Bingham in considering all the banded forms to be varieties of this form—

(1) Variety, *hipponax*, *Felder*.

Typical forms taken at the foot of the hills in March and April; it is a most variable form and merges into form *jalinder* in one direction and into form *pleistonax* in another; it is impossible to place some of the intermediate forms under any typical varietal form satisfactorily.

(2) Variety, *naganum*, n.

I propose this name for the narrow yellow banded forms which Moore considers to be a variety of *C. hipponax* and which are peculiar to the Naga Hills. It is certainly a very distinct form and worthy of a name. Three males taken in April at the foot of the hills are very small, only measuring 2.85 inches across; rainy season forms taken at Tamlu and at Nichuguard in August are larger.

(3) Variety, *pleistonax*, *Felder*.

A single typical male obtained at Nichuguard in August.

(4) Variety, *khasiana*, *Butler*.

Two typical males taken at the foot of the hills in April and August, the specimen taken in the latter month has the basal area much darker than the male taken in April. Forms intermediate between this and *jalinder* were also obtained.

(5) Variety, *jalinder*, *Butler*.

This is the commonest form; taken at the foot of the hills from February to September.

79. *Charaxes sulphureus*, *Rothsch and Jordan*.—Taken sparingly at the foot of the hills in June, October and November.

80. *Eulepis athamas* *Drury*.—Taken commonly throughout the year from the foot of the hills up to 5,000 ft.

81. *Eulepis arja*, *Felder*.—Not uncommon at the foot of the hills throughout the year. A single specimen was taken as high as 4,000 ft. in August.

82. *Eulepis Schreiberi*, *Godart*.—Recorded from the Naga Hills.

83. *Eulepis moori*, *Distant*.—Recorded from the Naga Hills.

84. *Eulepis eudamippus*, *Doubleday*.—Not uncommon. Males taken at the foot of the hills in March and April and at Tamlu in August.

85. *Helcyra hemina*, *Hewitson*.—Recorded from the Naga Hills.

86. *Apatura ambica*, *Kollar*.—Males exceedingly common at the foot of the hills throughout the year; a few also taken up to 4,500 ft. in October.

87. *Apatura sordida*, *Moore*.—A single male of this rare butterfly was obtained near Kohima at about 5,000 ft. in October and I also received a female from the adjacent state of Manipur taken in November. I believe this form has hitherto only been recorded from Sikkim.

88. *Apatura chevana*, *Moore*.—A single male of this beautiful butterfly was taken at the foot of the hills in July.

89. *Apatura parisatis*, *Westwood*.—Males exceedingly common at the foot of the hills throughout the year.

90. *Apatura florenciæ*, n. sp. Pl. A, figs. 5 and 6 ♂ Male. *Upperside*: forewing; basal area brown with a greenish golden sheen; the rest of the wing brownish-black with the following markings:—a yellow discal band composed of three large spots, the upper one almost filling the apex of the cell, the middle one filling the basal third of interspace 2 but not reaching its base and the lower one placed near the tornal angle in interspace 1; a postdiscal transverse band, composed of three yellow linear spots in interspaces 6, 5 and 4, a large diffuse spot in interspace 3 and small diffuse spots in interspaces 2 and 1, commencing at the costa beyond its middle and ending near the tornus; a small diffuse yellow spot beyond the postdiscal band in interspace 4 above which are two white subapical spots in interspaces 5 and 6. Hindwing, dusky greenish-brown with a golden sheen; costal area brownish-black; interspaces 5 and 6 yellowish near their bases and with diffuse yellow spots near their outer thirds, also a minute yellow spot in interspace 4; a black spot ringed with yellow ochre in interspace 2, a submarginal band consisting of yellow ochre lunules inwardly bordered by dark diffuse spots decreasing in width towards the tornal angle and stopping at vein 2; a narrow black marginal line outwardly bordered with yellow ochre.

Underside: pale greenish-yellow somewhat suffused with silvery; forewing, a discal yellow macular band as on upperside but paler, the upper spot inwardly very diffuse, the middle one inwardly bordered with chestnut and the lower one placed in a purplish-grey area which fills interspace 1 and reaches the dorsum; beyond this band in interspace 2 is a large black spot; the postdiscal band as on upperside but paler, the three upper

spots greenish or yellowish-white inwardly bordered with chestnut, the lower spots very indistinct; subapical spots as on upperside; a pale chestnut marginal line bordered on both sides with greenish-white. Hindwing: a greenish-white discal band, inwardly bordered with chestnut as far as vein 2, commencing a little beyond the middle of the costa, where it bends sharply outwards, slightly curves outwards as far as interspace 4 and then inwards as far as the middle of interspace 2 and then again outwards towards the tornal angle which it does not quite reach; a subternal black spot, centred with white and ringed with yellow, in interspace 2, above which a postdiscal series of four greenish or yellowish-white spots in interspaces 3, 4, 5 and 6, the lower ones sometimes indistinct; a pale chestnut marginal line bordered on both sides with greenish-white.

Abdomen and thorax: upperside yellowish-brown, underside bluish-grey. Eyes reddish-brown. Palpi reddish-brown above and yellowish-white below. Antennæ blackish-brown above and yellowish-brown below with a little white speckling near the base; club black.

Expanse 2.64—2.72 inches.

This is a well marked form and seems to be intermediate between *A. ulupi*, Doherty, and *A. pallas*, Leech, from both of which it is however quite distinct. It is decidedly a rare butterfly and in two years collecting only nine males were obtained, seven in September and October at 5,000 ft. and two in May at the foot of the hills. The female is apparently still rarer and I did not manage to get one. I was at first inclined to think that this form was *A. ulupi*, but on comparison with the co-type of that species in British Museum it proved abundantly distinct. It can be at once distinguished from *A. ulupi* on the upperside by its darker colour and by the black discal band between the yellow bands being immaculate and not broken up into a distinct spot in interspace 2; and on the underside by its greenish colour, in *ulupi* it is yellow; the discal band on the hindwing is angled in the middle whilst in *ulupi* it is nearly straight.

90. (*a*) *Apatura parvata*, Moore.—Apparently very rare. A single male taken at Jakama, 5,000—6,000 feet, in October.

91. *Dilipa morgiana*, Westwood.—Rather rare; taken at the foot of the hills in March and June and at 5,000—6,000 ft. from July to October. The female is very rare and I only succeeded in obtaining one in August. Most of the specimens were taken in March and October.

92. *Hestina nama*, Doubleday.—Very common throughout the year from the foot of the hills up to 6,000 ft.

93. *Parhestina persimilis*, Westwood.—A single male taken at Gaspani, 1,700 ft., in October. Two females were also taken by my Native Collector in Manipur during the same month. I believe this form has not previously been recorded further east than Sikkim.

94. **Euripus halitherses**, *Doubleday*.—Males taken commonly at the foot of the hills and upto 2,000 ft. Also a single specimen as high as Kohima. A few specimens of the female form *isa*, Moore, were obtained in April, July, October and November and a single specimen of the form *cinnamomeus*, Wood-Mason, was obtained at 4,500 ft. in October. The females are by no means common.

95. **Sephisa chandra**, *Moore*.—A single male taken at the foot of the hills in May and several males and a single female (Moore's fourth form) taken near Kohima in September and October. Several more were seen flying round the tops of the trees in my garden. A female was seen as late as December, it was benumbed in the cold and I nearly succeeded in catching it with my fingers, having no net with me at the time. The female differs in structure a good deal from the male in having the palpi much longer than in that sex and in the specimen obtained it is nearly three times as long. This peculiarity, which gives the insect a curious effect, does not appear to be recorded by either de Nicéville, Moore or Bingham.

96. **Neurosigma doubledayi**, *Westwood*.—Recorded from the Naga Hills, but I have not met with it.

97. **Stibochiana nicea**, *Gray*.—Not uncommon at the foot of the hills from January to August and as 5,000—6,000 ft. from September to November. A dry season form taken in January is much smaller, the postdiscal blue band on the hindwing is not sinuous and is better defined; the subterminal spots have the inner blue border and outer white border broader, the latter almost reaching the termen, the black central spots very small and the terminal black line very narrow; all the blue markings are much paler and brighter. Figure 2, plate 217, Lep. Ind., vol. iii evidently is intended to represent this extreme dry season form.

98. **Symphædra khasiana**, *Swinhoe*.—A few specimens taken at the foot of the hills in April, June and October. The males differ from my Bhutan specimens in having the ochreous spots on the forewing more conspicuous and the terminal band more developed in some specimens almost as in *S. dirtea*, the subterminal band on the hindwing is also bluer and not so violet. The solitary female taken has all the spots tinged with ochreous. The form from these hills appears to be intermediate between the form from Bhutan and *S. dirtea* from Burma.

99. **Dophla nara**, *Moore*.—Two males taken in July and eight males in August at 5,000—6,000 ft.

100. **Dophla sahadeva**, *Moore*.—Males not uncommon from July to October at 4,600 to 6,000 ft. Females are rare. Fresh specimens were only obtainable in July and August and towards the end of the latter month all the specimens taken were battered.

101. **Dophla derma**, *Kollar*.—Apparently rare; a single female taken at 1,700 ft. in March and another was seen.

102. *Euthalia lepidea*, *Butler*.—Fairly common at the foot of the hills throughout the year.

103. *Euthalia appiades*, *Ménétriés*.—A few specimens taken at the foot of the hills in February, March and November.

104. *Euthalia jahnu*, *Moore*.—Obtained by Mr. Doherty in the Naga Hills.

105. *Euthalia kesava*, *Moore*.—A few specimens taken at the foot of the hills, April to July.

106. *Euthalia lubentina*, *Cramer*.—Two females taken in April and a male in August at 1,700 ft.

107. *Euthalia franciæ*, *Race attenuata*, n.—Under the above name I propose separating the Eastern race of *E. franciæ*, from the Khasia and Naga Hills, from the typical form occurring in Sikhim and Bhutan. It can easily be distinguished by its much darker colour and by the bands being very much narrower; in only one specimen that I have seen is it as broad. The colour of the discal band is very variable; in many specimens there is a tendency for the spot to become white and in some specimens the bands are entirely white. This form is not uncommon at 5,000—6,000 ft. from August to October.

108. *Euthalia phemius*, *Doubleday*.—Occurs at the foot of the hills, a few specimens taken in June, August and October.

109. *Euthalia telchinia*, *Ménétriés*.—A single female taken at Gaspani, 1,700 ft., in July.

110. *Euthalia garuda*, *Moore*.—Not common probably from the absence of its food plant. A single male taken at the foot of the Hills in August is much darker than any specimen I have seen and has the white discal spots very small, the spot in interspace 4 being wanting.

111. *Euthalia jama*, *Felder*.—A single male taken at the foot of the hills in March which is smaller than specimens in my collection from Bhutan and the Khasia Hills being only 2.41 inches in expanse. The markings on the underside are very pale and the white streaks hardly visible.

112. *Euthalia apicalis*, *Vollenhoven*.—A male taken at the foot of the hills in March and a female in June. The male agrees with the figure of *E. eriphyle* de N. as figured in Lep. Ind. iii, pl. 238, (2) and the female agrees with the figure of *E. apicalis*, Lep. Ind. iii, pl. 239, (1b.) except that the discal spots are longer. I have placed both under *E. apicalis* following Bingham who considers *E. eriphyle* de N. to be same as this species.

113. *Parthenos gambrisius*, *Fabr*.—Fairly common at the foot of the hills. The males of the spring brood have the apices very white, whilst in the summer broods there is only a trace of this as if the wings had been slightly rubbed.

114. *Moduza procris*, *Cramer*.—Common throughout the year at low elevations.

115. *Liminitis zayla*, *Doubleday*.—Not uncommon at 6,000—7,000 ft. in the latter half of August and the beginning of September. The females seem to be very rare.

116. *Liminitis daraxa*, *Doubleday*.—Very common, many specimens taken from June to November at the foot of the hills and up to 7,000 ft.

117. *Liminitis dudu*, *Westwood*.—Males rather common at 6,000—7,000 ft. from August to November; a few were also taken at 1,700 ft. in April. Females appear to be very rare and none were taken.

118. *Lebadea martha*, *Fabr.*—Not uncommon at the foot of the hills from June to August.

119. *Auzakia danava*, *Moore*.—A single male taken at 1,700 ft. in August and many males at 5,000—7,000 ft. during September and October. Specimens taken in August and September are larger and darker than those taken in October; one specimen taken in October is as small and pale as specimens from the N.-W. Himalayas but as a rule they are a good deal larger and darker.

120. *Pantoporia inara*, *Doubleday*.—Dry season forms taken at the foot of the hills in February and November and wet season forms in July, August and September.

121. *Pantoporia kanwa*, *Moore*.—Recorded from the Naga Hills, but I have not met with it.

122. *Pantoporia cama*, *Moore*.—Not uncommon; the autumn form which is intermediate between the summer and spring forms was obtained in October and November at 2,000 ft. and up to 5,000 ft. The spring form, which is the smallest and palest, was obtained at 2,000 ft. in April and the summer form, which is the darkest and largest, was taken from the foot of the hills up to 5,000 ft. from June to August.

123. *Pantoporia selenophora*, *Kollar*.—Males very common at low elevations; one was taken as high as 4,600 ft. Small spring broods taken in February, and summer broods from June to October, and one specimen as late as November. The autumn brood which is intermediate between the summer and spring broods began to appear in October, many specimens being taken in November.

124. *Pantoporia zeroca*, *Moore*.—Not very common; dry season forms taken at the foot of the hills in November and wet season forms in July and August at 1,700 ft. to 4,600 ft.

125. *Pantoporia orientalis*, *Elwes*.—This Eastern form of *P. opalina* is not uncommon at 4,500—7,000 ft. from June to November. It differs from *P. opalina* from the N.-W. Himalayas in having the white bands narrower.

126. *Pantoporia ranga*, *Moore*.—A few specimens taken at low elevations from July to November.

127. *Athyma perius*, *Linn.*—An extremely common butterfly throughout the year.

128. *Athyma asura*, Moore.—Three males taken at Gaspani, 1,700 ft., in August and October.

129. *Neptis astola*, Moore.—Very common; wet season forms taken at Kohima from August to November and dry season forms in February.

130. *Neptis varmona*, Moore.—Not so common as the last; dry season forms taken at the foot of the hills and at Kohima in February.

131. *Neptis yerburii*, Butler.—Taken at 5,000 ft. from July to November, but not commonly; the form from these hills have the white bands somewhat narrower than the form from the N.-W. Himalayas.

132. *Neptis soma*, Moore.—A few specimens taken at the foot of the hills in January and February.

133. *Neptis guilta*, Swinhoe.—Recorded from the Naga Hills.

134. *Neptis cartica*, Moore.—Recorded from the Naga Hills, but I have not met with it.

135. *Neptis radha*, Moore.—Mr. Doherty obtained this in the Naga Hills but it must be very rare.

136. *Neptis ananta*, Moore.—Not uncommon from July to October. Two wet season form males taken at the foot of the hills in July and August and many males of the dry season form with pale yellow bands were taken at 5,000—6,000 ft. from August to October; it is curious that I only obtained the form with the dark bands at low elevations and the form with the pale bands at high elevations.

137. *Neptis miah*, Moore.—Not uncommon at the foot of the hills in June and July, a single male was also taken in March.

138. *Neptis viraja*, Moore.—Recorded from the Naga Hills, but I have not met with it.

139. *Rahinda hordonia*, Stoll.—A few males taken at low elevations in February and August.

140. *Cyrestis thyodamas*, Boisduval.—A single male was taken at Kohima in September and another was seen; it does not appear to be common.

141. *Chersonesia risa*, Doubleday.—Two males obtained at Nichuguard in June.

142. *Junonia iphita*, Cramer.—Very common throughout the year in the neighbourhood of Kohima. Dry season forms taken in February, May, November and December, and wet season forms from August to November.

143. *Junonia lemonias*, L.—Common at low elevations, not taken above 4,000 ft. The autumn brood is intermediate in coloration and depth of markings between the summer and spring broods, specimens of the latter taken in February are very small and pale underneath.

144. *Junonia orithya*, Linn.—A very common butterfly throughout the year in the neighbourhood of Kohima.

145. *Junonia atlites* Johansson.—Not common, a few wet season forms taken in October and November at the foot of the hills and below Kohima

4,000 ft. A dry season male taken in February at the foot of the hills is very small and has the apex of the forewing distinctly truncated; on the underside the ocelli are quite wanting and both wings are crossed by a dark conspicuous dark lilacine brownish-grey band.

146. *Junonia hierta*, *Fabricius*.—Fairly common at low elevations.

147. *Junonia almana*, *Linn.*.—Not uncommon; dry season forms taken in February and October at the foot of the hills up to 4,500 ft. Wet season forms taken in October.

148. *Vanessa cardui*, *Linn.*.—Very common throughout the year at about 5,000 ft.

149. *Vanessa indica*, *Herbst*.—Common throughout the year at 5,000-6,000 ft.

150. *Vanessa canace*, *Johannsen*.—Rather common from July to October at 4,000-6,000 ft.; less plentiful in the Winter.

151. *Araschnia dohertyi*, *Moore*.—Fairly common, appearing first on the wing in August, fresh specimens fly up to the beginning of October. Two worn specimens taken as late as 7th November. Not seen below 5,000 ft., most of the specimens were taken at 6,000-7,000 ft.

Bingham remarks "a slightly divergent form. Differs from *prorsoides* in the white not ochraceous discal band on the upperside of the wings, and the more slender terminal markings."

In his description he also states that most of the markings are *white*. In all my *fresh* specimens these markings are *yellow*, the two spots in interspaces 3 and 4 only inclining to white, in some specimens these also are quite yellow. In some *worn* specimens these yellow markings become whitish and in a few specimens *all* the markings are white on both wings; I think it likely that Bingham's description is based on a worn specimen; Mr. Elwes gives excellent figures of both sexes in his notes on Naga Hill butterflies previously referred to. This butterfly has, I believe, only been recorded from these hills.

152. *Symbrenthia lucina*, *Cramer*.—Common throughout the year. The seasonal forms do not vary much; a specimen taken in February, the height of the dry season is as dark as any wet season form. It occurs from the foot of the hills up to 6,000 ft.

153. *Symbrenthia hypselis*, *Godart*.—Rather common. There appear to be three seasonal forms (1) a large dark form taken commonly at about 5,000 ft. and sparingly at 1,700 ft. from July to November; (2) a small form with broader and paler fulvous markings (*S. cotanda*, *Moore*) taken in October at 5,000 ft. and at the foot of the hills in February and March; (3) an intermediate form taken at 1,700 ft. in June and July.

154. *Symbrenthia niphanda*, *Moore*.—Rare, only two males and a female obtained in two years' collecting at 5,000-6,000 ft. in August and October.

155. *Rhinopalpa polynice*, *Cramer*.—Recorded from the Naga Hills, but I have not met with it.

156. *Hypolimnas bolina*, *Linn.*—Very common as low elevations throughout the year; rather scarce below Kohima at about 4,000 ft.

157. *Penthema lisarda*, *Doubleday*.—Has been recorded from the Naga Hills.

158. *Doleschallia continentalis*, *Frühstorfer*.—Very common at low elevations from May to July; scarce near Kohima from September to November.

I have not seen *D. malabarica* from South India, but *D. continentalis* from North India and Assam can always be distinguished from the Ceylon form by having the termen at the apex between veins 7 and 9 *concave*, in all Ceylon forms that I have seen it is either straight or even *convex*.

159. *Kallima inachus*, *Boisduval*.—Fairly common from the foot of the hills upto 6,000 ft. from March to November.

160. *Kallima knyvetti*, *de N.*—Rather rare, several males and one female taken at 5,000—3,000 ft. from July to November, my last specimen, a female, being taken on 6th of November. This beautiful butterfly appears to be very local and keeps to thickly wooded ravines; perfect specimens are difficult to obtain.

161. *Cethosia cyane*, *Drury*.—Not common, taken at the foot of the hills upto 4,600 ft. in January and from July to November. It is not nearly so common as *C. biblis*.

162. *Cethosia biblis*, *Drury*.—Exceedingly common at 4,000—7,000 ft. from July to September; a few specimens also taken in January and February at the foot of the hills; these only differ from the summer brood in being smaller. The grey variety of the female was very rare.

163. *Cynthia erota*, *Fabr.*—Males fairly common throughout the year, females rather scarce. Small dry season forms taken at the foot of the hills from January to March; intermediate forms taken at foot of the hills and up to 4,600 ft. in April and November, and wet season forms at foot of the hills up to 4,600 ft. from June to October.

164. *Atella phalantha*, *Drury*.—Common, from August to November from the foot of the hills up to 4,600 ft.

165. *Issoria sinha*, *Kollar*.—Taken commonly at low elevations, April to December, and near Kohima from August to November.

166. *Cupha erymanthis*, *Drury*.—Rather scarce; wet season forms taken at the foot of the hills in May and August and at 4,600 ft. in October; a single male of the dry season form taken at the foot of the hills in the latter half of November.

The wet season form is larger and darker than specimens from Kumaon in my collection.

The dry season form taken in November differs from the wet season form in being smaller and on the upperside paler; underside paler and the markings not so pronounced and without any trace of the reddish-ochreous round discal spots; the yellow discal fascia on the forewing is slightly darker and not such a clear yellow as in the wet season form and almost of the same shade as the ground colour giving the whole of the undersurface a very uniform appearance.

167. *Cirrhochroa mithila*, Moore.—Not uncommon; taken at the foot of the hills in May, October and November and at 4,500—5,000 ft. in October.

168. *Cirrhochroa aoris*, Doubleday.—Not very common; obtained at the foot of the hills from March to November and at 5,000 ft. in July.

169. *Argynnis childreni*, Gray.—Fairly common in gardens at Kohima from July to October.

170. *Argynnis hyperbius*, Johanssen.—Very common throughout the year near Kohima.

171. *Ergolis ariadne*, Johanssen.—Not uncommon at low elevations in February.

172. *Ergolis merione*, Cramer.—A single female taken near Kohima at about 3,000 ft. in October.

173. *Pseudergolis wedah*, Kollar.—Not uncommon at 5,000 ft. from August to November.

174. *Calinaga brahma*, Butler.—Five males and a female taken in my garden at Kohima in April and May; several more were seen flying round the tree tops; they were difficult to catch as they seldom came within reach of the net. The flight is rather like that of *Danaïs tytia*.

Sub-family—ACREINÆ.

175. *Pareba vesta*, Fabr.—Very common in August and September. Numerous pupæ were brought to me at the end of August, all attached to blades of *ekra* grass.

Sub-family—LIBYTHEINÆ.

176. *Libythea lepita*, Moore.—A few specimens taken at 1,700 ft. and 5,000 ft. in March and October.

177. *Libythea myrrha*, Godart.—Taken sparingly in April and November at 1,700 ft. and in October at 5,000 ft.

FAMILY—NEMEOBIDÆ.

178. *Dodona dipœa*, Hewitson.—Taken sparingly from September to December at 5,500—6,500 ft.

179. *Dodona eugenes*, Bates.—Taken sparingly at 6,000—7,000 ft. from August to December.

180. *Dodona egeon*, Doubleday.—Bingham records this from the Naga Hills. I have not met with it.

181. *Dodona ouida*, *Moore*.—Taken commonly above Kohima 6,000—7,000 ft. during August and September. At the end of November and beginning of December a fresh brood appeared at a lower elevation, when many specimens were taken in my garden in Kohima; this brood averaged smaller than specimens taken in September, the difference in size being especially noticeable in the females.

182. *Dodona adonira*, *Hewitson*.—Rather uncommon. Males taken near running water, sucking up the moisture from the sand, at 5,500—6,500 ft., from October to December. Females were not taken.

183. *Abisara fylla*, *Doubleday*.—Males common, females very rare from August to December at 4,000—7,000 ft.

184. *Abisara neophron*, *Hewitson*.—Recorded from the Naga Hills. I have not met with it.

185. *Abisara chela*, *de N*.—Obtained by Mr. Doherty in the Naga Hills.

186. *Zemeros flegyas*, *Cramer*.—Very common in gardens at Kohima. Three well marked seasonal forms occur.

(1) Summer brood with markings well defined, taken from July to October.

(2) Autumn brood darker and larger than the summer brood taken from September to December.

(3) Winter brood, much smaller and paler than the summer brood with all markings small and indistinct, taken from December to February.

(To be continued.)

THE PALMS OF BRITISH INDIA AND CEYLON,
INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART. V.

(With Plates XVIII—XXV, and text-figures 13—19).

(Continued from page 995 of Volume XX.)

CORYPHA UMBRACULIFERA, L. Sp. Pl. 1187 (1753); Gaertn., Fruct., I. 18, t. 7; Roxb. Fl. Ind. II. 177; Mart. Hist. Nat. Palm. III, 232, t. 108, 127 (partim); Griff. in Calc. Journ. Nat. Hist. V. 319; Palms Brit. India 116; Dalz. and Gibs., Bombay Fl. Suppl. 94; Kurz For. Fl. II, 525; Brand. For. Fl. 549; Hooker, Fl. Brit. Ind. VI, 428; Trimen, Fl. Ceyl. IV, 328; Talbot Trees Bomb. ed. 2, p. 343; Prain, Bengal Pl. 1090; Brandis, Ind. Trees 657.—*C. gebanga*, Kurz For. Fl. II, 525.—*C. macropoda*, Kurz in Journ. As. Soc. Beng. XLIII, II. 197; For. Fl. II, 525.¹

NAMES.—Talipot Palm; Fan-Palm; Tala (Ceylon); Condapana (Tam.); Sidalum (Tel.); Talee (Beng.); Coddapana (Mal.).

DESCRIPTION.—Trunk erect, straight, cylindric, 30-80 feet high, with a diameter of 2-3 feet, annulate. Leaves 8-16 feet in diameter, sublunate or circular, palmately pinnatifid, plicate, cleft to about the middle into 80-100 linear-lanceolate, acute or 2-fid lobes; petiole 5-10 feet long, very stout, the margins armed with short, compressed, dark-coloured spines. Spadix pyramidal, 10-20 feet long, decompound, shortly and stoutly peduncled; peduncle clothed with tubular spathes which are pierced by the primary branches, branchlets forming pendulous spikes. Calyx broadly 3-lobed; petals oblong, about $1\frac{1}{2}$ inch long. Ovary suddenly contracted into the style. Drupe shortly stipitate, globose, $1\frac{1}{2}$ inch in diameter, with 2 abortive carpels at its base, greyish olive-coloured

¹ *Corypha gebanga* Kurz and *C. macropoda*, Kurz have been referred to *C. umbraculifera* by Prain.



TALIPOT PALM IN FLOWER.



roughish ; seeds globose, very hard, smooth and polished. (Fig. 13).

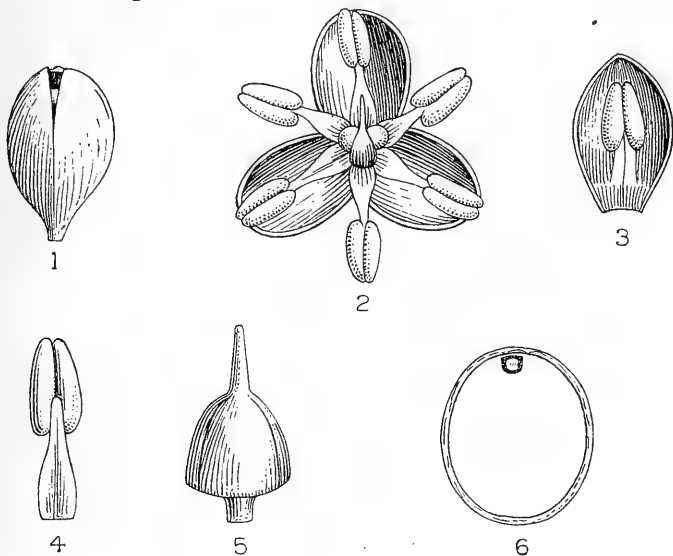


FIG. 13.—*Corypha umbraculifera*.

- | | |
|----------------------------------|---|
| 1. Corolla just before opening. | 4. Dorsal view of stamen. |
| 2. Open corolla seen from above. | 5. Longitudinal section through pistil. |
| 3. Petal with stamen. | 6. Vertical section of seed. |

1—5 enlarged. (After Martius).

HABITAT.—Ceylon : in the moist low region below 2,000 feet, rather common ; Malabar Coast ; Kanara : moist forests of the Kumpta and Honavar talukas of Northern Kanara, covering extensive areas near the Gairsoppa and Yena rivers, also on the Yellapur Ghats ; sometimes planted in gardens near the coast ; South Andaman Islands ; Little Coco ; Great Coco ; cultivated in tropical India and Burma.

Hooker makes the following remark in Trim. Fl. Ceyl. IV. 328 : “ This must be a native palm [of Ceylon], but I have never seen it in original jungle. Of the vast number of seedlings which come up near the parent tree, very few arrive at maturity, the young leaves being continually cut. Beddome remarks that he has never seen it wild in S. India.”

FLOWERS.—November to January.

GERMINATION.—The development of the young palm has been observed by Gatin.¹ The seed is globose with uniform albumen.

¹ Gatin, C. L., *Recherches Anatomiques et Chimiques sur la Germination des Palmiers*. Paris, 1906, p. 248.

The embryo has the shape of a short cylinder with an elongated cone on top of it. It is covered all over, except in the central portion of the end of the radicle, with a continuous epidermis, the cells of which are slightly elongated in the direction of the radius. The plumule is straight and its axis coincides with that of the embryo. In the peripheric portion of the cotyledon there are three or four hypo-epidermic layers consisting of smaller and more granular elements than the rest. Vascular bundles of elongated and narrow cells run through the cotyledon.

At the moment of germination the cotyledonal petiole becomes longer and forms, close to the seed, a swelling. At the base of the primary root thin lateral rootlets are formed, but none of these bear root-hairs. At a later state numerous lateral roots are developed which are smaller than the primary root. The first leaf is reduced to a sheath. Finally the cotyledonal petiole and sheath begin to wither and decay. (Fig. 14.)

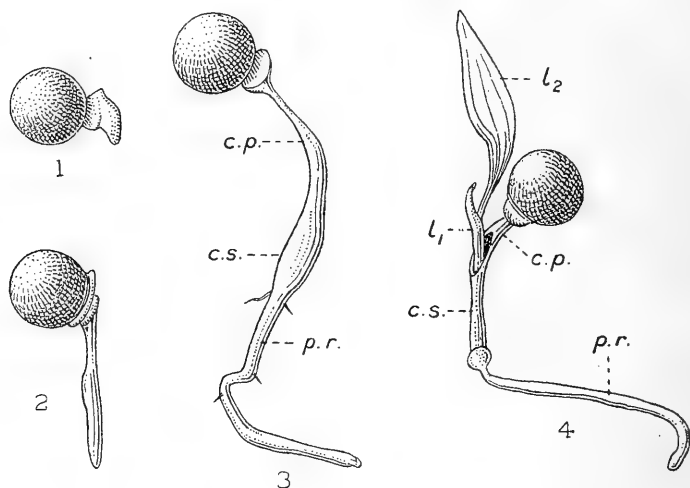


FIG. 14.—Successive stages in the germination of *Corypha umbraculifera*.
c. p. = cotyledonal petiole. *p. r.* = primary root.
c. s. = cotyledonal sheath. *l1.* and *l2.* = first and second leaf.

USES.—The leaves are extensively used by the lower classes of Singalese as umbrellas. They are extremely well adapted for that purpose, one outspread leaf affording sufficient shelter for seven or eight persons. Umbrellas made of the leaves are largely exported



TALIPOT PALM BEARING SEED.

3

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

from *narā*. Some of the sacred records of the Singalese are written on pieces of the blade of these leaves with either a brass or iron style. It has been asserted by various authors that such records have resisted for ages the ravages of time, by others it has been denied. Under the native government of Ceylon each person was allowed, according to the social station he occupied, to have a certain number of the gigantic leaves of the Talipot, folded up in the form of fans, borne before him.

In Ceylon they beat the pith of the stem in mortars to flour and bake cakes of it, which taste much like white bread; it serves them instead of corn before their harvest is ripe. The seeds are nearly as hard as ivory and are extensively employed in the manufacture of beads, or are coloured and sold as coral, or even made into small bowls. In Europe they are used in the manufacture of buttons. They are known in the trade as *bazarbatu*, *bajurbet* or *bayurbatum* nuts, and a fairly considerable export in these goes from Bombay. The trade is chiefly carried on by Arabs. It is not improbable that after the removal of the pith, the long fibro-vascular cords of the stem might be employed in the same way as the fibre of *Caryota urens*.

Robert Knox's quaint description¹ of the Talipot is worth quoting, though it may contain some repetitions of what we have said above: "It is as big and tall as a ship's mast, and very straight, bearing only leaves which are of great use and benefit to this people, one single leaf being so broad and large that it will cover some fifteen or twenty men, and keep them dry when it rains. The leaf being dried is very strong and limber, and most wonderfully made for men's convenience to carry along with them, for though this leaf be thus broad when it is open, yet it will fold close like a lady's fan, and then it is no bigger than a man's arm. It is wonderfully light; they cut them into pieces and carry them in their hands. The whole leaf-spread is round almost like a circle, but being cut in pieces for use are near like unto a triangle; they lay them upon their heads as they travel, with the peaked end foremost, which is convenient to make their way

¹ In "An Historical Relation of the Island of Ceylon, by Robert Knox, a captive there near twenty years." London, 1681.

through the boughs and thickets. When the sun is vehement hot, they use them to shade themselves from the heat; soldiers all carry them, for besides the benefit of keeping them dry in case it rain upon the march these leaves make their tents to lie under in the night. A marvellous mercy, which Almighty God hath bestowed upon this poor and naked people in this rainy country."

ILLUSTRATIONS.—Plate XVIII shows a gigantic specimen of the Talipot Palm in flower. In its youth it devotes itself to producing only huge fan-shaped leaves; later on a trunk begins to form which grows straight as a mast. The grand white stem is encircled with closely set ring-marks, showing where it has born and shed its leaves from year to year. When the Talipot attains full maturity, it grows somewhat smaller leaves, and develops a gigantic bud some four feet in height. In due course this bursts with a report, and unfolds a lovely white blossom which expands into a majestic pyramid of cream-coloured flowers, which rise to a height of twenty feet above the leafy crown. At the same time the leaves begin to wither and cover in this state for some time the upper part of the stem, as may be seen in our picture.

Plate XIX shows the same palm a short time after. The magnificent bloom is succeeded by the fruit which consists of innumerable nuts or seeds. It now begins to droop and within a year it falls dead. (Plate XX.)

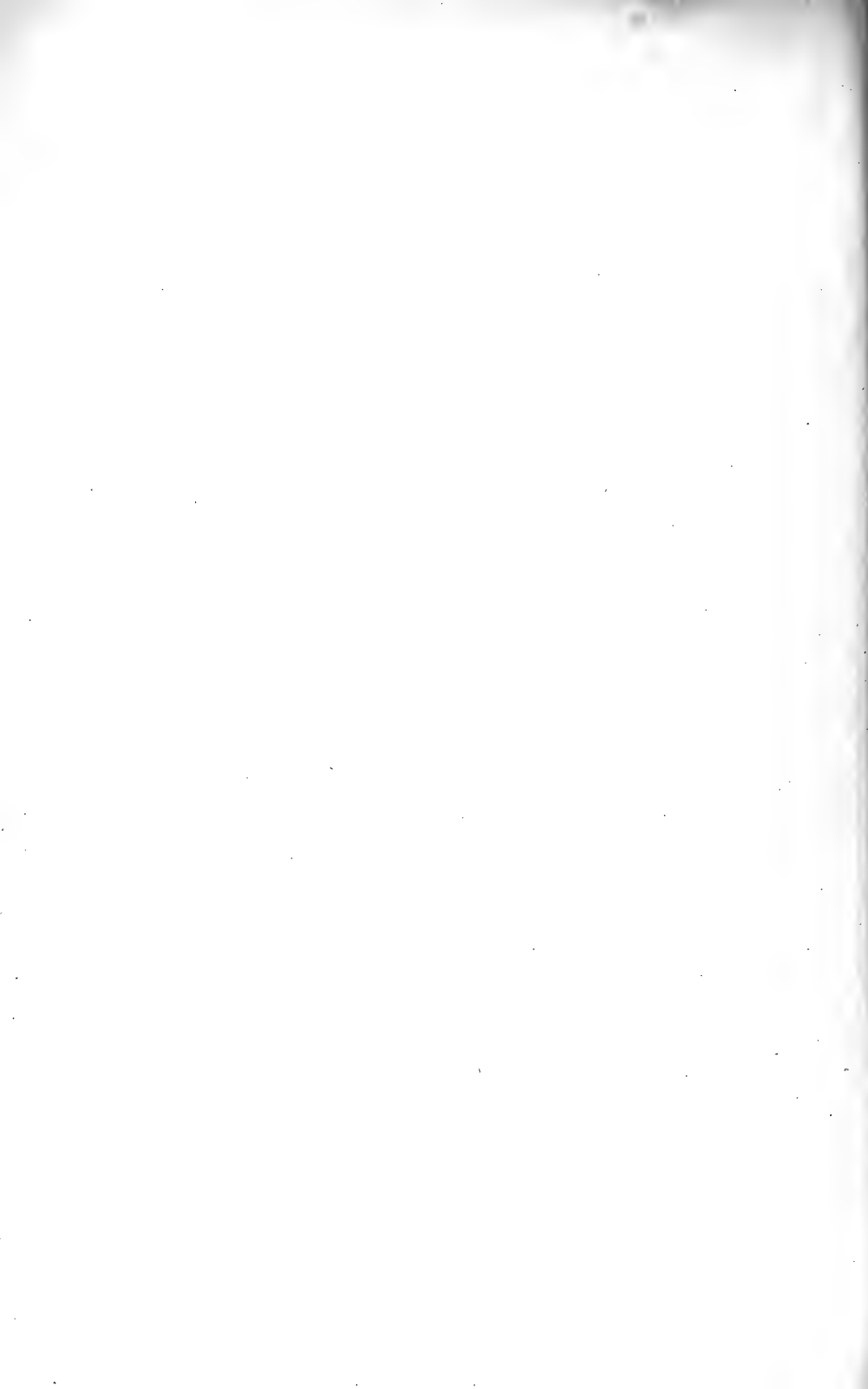
CORYPHA TALLIERA, Roxb. Cor. Pl. III, 251, t. 255, 256; Fl. Ind. III, 174; Kunth Enum. III, 236; Mart. Hist. Nat. Palm. III, 231; Griff. in Calc. Journ. Nat. Hist. V, 317; Palms Brit. Ind. 114, t. 220, E. F.; Wall. Cat. 8616; Hook. Fl. Brit. Ind. VI, 428; Brandis, Ind. Trees, 658.—*Talliera bengalensis*, Spreng. Syst. Veg. II, 18.—*T. taleti*, Mart. in Roem.—Schult. Syst. VII, 1306.

NAMES.—Tara, Tallier, Tareet (Beng.).

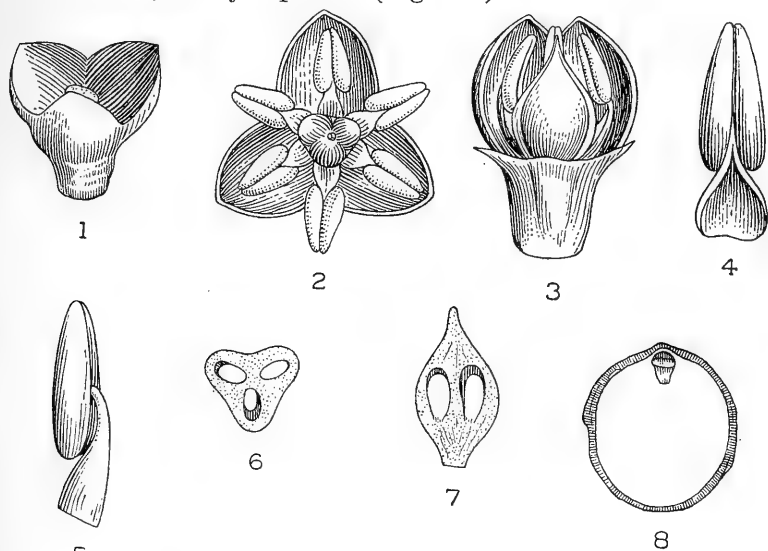
DESCRIPTION.—Trunk perfectly straight, about 30 feet high, equally thick throughout, obsoletely annulate, dark brown, rather rough. Leaves palmate-pinnatifid, subrotund, complicate above the middle, sub-glaucous, 6 feet long, 15 feet broad, 90-100-fld., lobes deeper and broader than in *umbraculifera*, the central 3-3½ feet, basal ones overlapping; petiole 5-10 feet long, not spirally



THE LAST STAGE OF THE TALIPOT PALM.



arranged, bi-auricled, remarkably strong, upper side deeply channelled, the sharp margins armed with numerous, short, strong dark-coloured, polished, compressed spines. Spathes as many as there are primary and secondary ramifications in the spadix, all smooth and obtuse. Spadix 20 feet or more high, supradecom-pound; primary branches alternate, round, spreading nearly horizontally with their apices ascending; secondary ramifications alternate, bifarious, compressed, drooping, recurved, soon dividing into numerous, variously curved, smaller, subcylindric branchlets covered with innumerable, small, white, odorous, subsessile flowers. Calyx minute, obscurely 3-lobed; petals 3, oblong, concave, fleshy, smooth; stamens 6, nearly of the length of the petals, at the base broad, and somewhat united; anthers ovate, dorsifixed. Ovary, 3-lobed, 3-celled, suddenly contracted into the style; style shorter than the stamens; stigma simple. Drupes 1-3 $1\frac{1}{2}$ inch in diameter, wrinkled, dark olive or greenish-yellow, pulp in small proportion, and yellow when the fruit is ripe. Seed solitary, round, attached to the base of the drupe, white, horny, with a small cavity in the centre; embryo apical. (Fig. 15.)

FIG. 15.—*Corypha talliera*.

- | | |
|---|-----------------------------------|
| 1. Calyx. | 5. Side view of stamen. |
| 2. Open flower seen from above. | 6. Transverse section of ovary. |
| 3. Longitudinal section of flower showing 2 stamens and pistil. | 7. Longitudinal section of ovary. |
| 4. Ventral view of stamen. | 8. Longitudinal section of seed. |
- 1—7 magnified. (After Martius).

HABITAT.—Bengal.

FLOWERS.—At the beginning of the hot season; fruit ripens 9 or 10 months afterwards.

USES.—The leaves are used for writing upon with pointed steel bodkins; besides for tying the rafters of the native houses, as they are strong and durable. The wood is not applied to any useful purpose.

NANNORHOPS, H. Wendl. Bot. Zeitg. 1879, 147.

(From the Greek "Nannos", a dwarf and "rhops", a low shrub.)

Griff. Palms Brit. Ind., 135.; Aitch. Journ. Lin. Soc. 19, 140, t. 26.—Benth, and Hook. Gen. Pl. III. II, 923, 84; Boiss. Fl. Or. V. 47, app. 754.

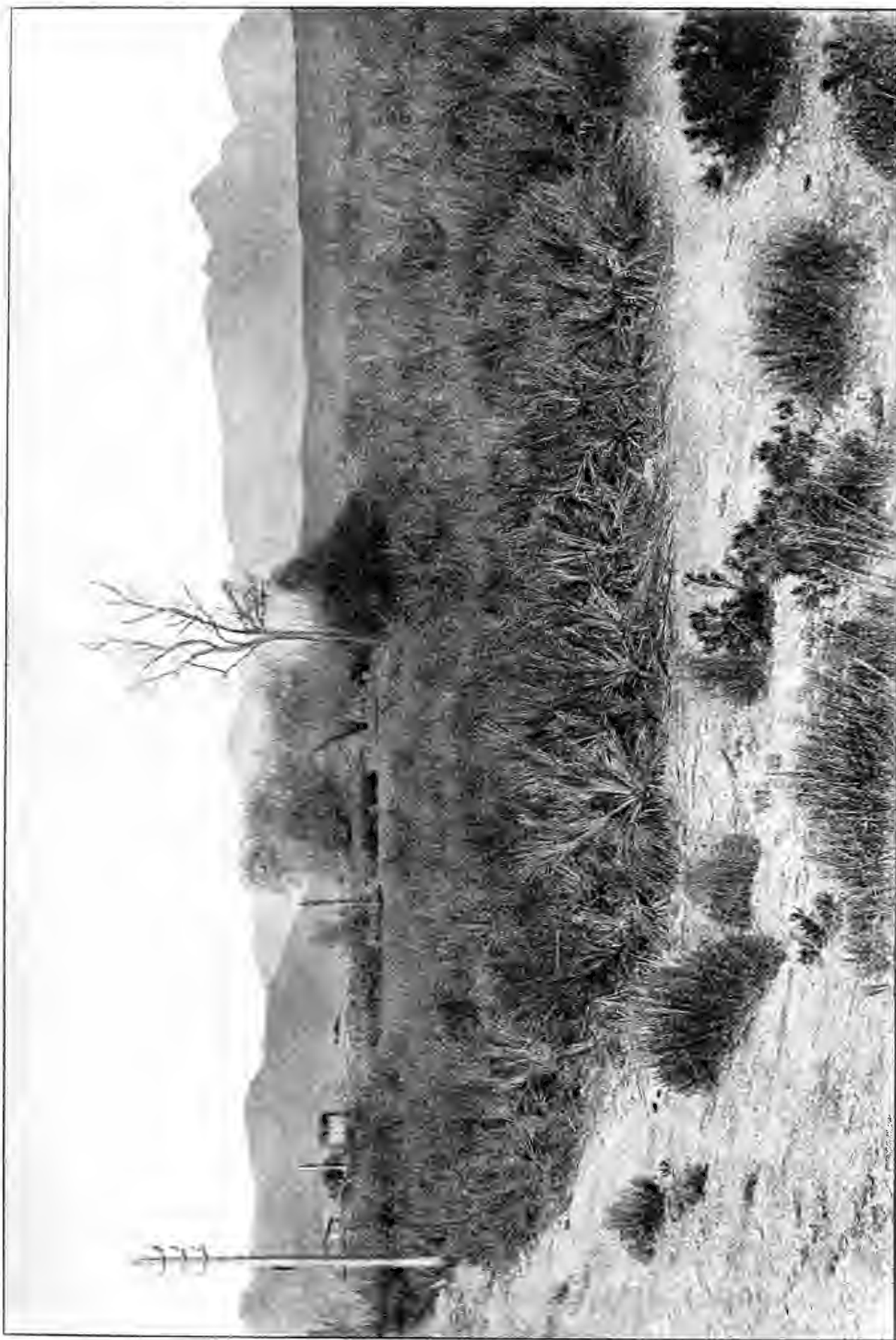
A gregarious, tufted, low-growing, glabrous palm; stems or rhizoms robust, prostrate, branching. Leaves cuneately flabellate, rigid, plicate, split into curved 2-fid segments; petiole short. Spadix axillary (intrafoliar), much-branched; spathes tubular, sheathing, spathelets ochreate. Flowers polygamous. Calyx tubular, membranous, unequally 3-lobed. Corolla 3-partite, valvate. Stamens in hermaphrodite flowers 6, in male flowers about 9. Ovary 3-gonous; ovules basilar; style short; stigma 3-toothed. Drupe small, globose or oblong, 1-seeded; style basilar. Seed free, erect, ventrally hollowed, hilum small; albumen uniform; embryo dorsal or subbasilar.

Species 1; India, Afghanistan.

NANNORHOPS RITCHIEANA, H. Wendl. in Bot. Zeit. 1879, 148; Aitchis. in Journ. Linn. Soc. XIX, 140, 141, 187, t. 26. *Chamærops ritchieana*, Griff. in Calc. Journ. Nat. Hist. V. 342; Palms Brit. India 135; Brandis For. Fl. 547; Gard. Chron. 1886, 652, fig. 128, 129; Mart. Hist. Nat. Palm. III. 252.

NAMES.—Mazari (Vern.); Mzarai (trans-Indus); Maizûrrye (Pushtu); Kilu, Kaliun (Salt Range); the fibre is called patha in the Punjab; Pfis, Pesh, Pease, Fease, Pfarra, Dhora (Sind, Baluchistan).

DESCRIPTION.—A low gregarious shrub, the leaves usually tufted from an underground much-branched rhizome 8-10 feet long, as



A LANDSCAPE IN BALUCHISTAN BETWEEN SIBI AND QUETTA, SHOWING A DENSE GROWTH OF MAZARI PALMS (*Nannorhops Ritchiana*, H. Wendl.).



thick as a man's arm, sometimes from an erect branching stem, reaching 20 feet high. Leaves 2-4 feet long and broad, cuneately flabellate, rigid, plicate, greyish-green, consisting of 8-15 linear rigid segments 12-15 inches long, with often interposed fibres, folded, 2-partite; petioles unarmed, 6-12 inches long; base of petiole without any reticulate inner layer, but with a mass of rust-coloured wool. Flowers polygamous, male and hermaphrodite. Spadix pyramidal; branches ascending and recurved; branchlets slender; branches and branchlets arising from the axils of tubular, membranous, sheathing bracts with prominent, reticulate, longitudinal nerves; branchlets bifarious, with numerous flowers in the axils of turbinate, membranous, sheathing bracts, with a thin membranous edge. All the bracts are closed sheaths, with a short, subulate or triangular apex; they are spirally arranged, though apparently distichous on the principal axis and the main branches. Flowers in pairs in the axils of hyaline bracts, distinct or connate, and bicuspidate. Calyx thinly membranous, flat, 3-toothed. Petals connate at the base. Stamens 6, sometimes 9 in the male flowers, in the male flowers inserted in the corolla-tube, in hermaphrodite flowers in its throat; anthers sagittate, attached at the back above the base to the subulate filaments. Ovary 3-celled, narrowed into the short style. Fruit an ovoid or subglobose 1-seeded drupe, with the rudiments of 2 abortive carpels, supported by the marcescent calyx, petals, and the remains of the filaments, $\frac{1}{2}$ - $\frac{3}{4}$ inch in diameter surface minutely wrinkled; albumen horny, with a central cavity.

Beccari is of opinion that there exist several forms of *Nannorhops ritchieana* on account of its wide distribution in the arid region of Western India, Baluchistan and Afghanistan. He says that the seeds show marked differences, some being spherical, others oval, some measuring $\frac{1}{3}$ inch in diameter, others $\frac{2}{3}$ inch. The seeds are said to be very hard and the albumen homogeneous.¹

GERMINATION.—The successive stages in the development of this palm, as observed by Holm,² are given in figure 16, which

² Beccari, O. Notizie sul '*Nannorhops Ritchieana*' H. Wendl. Webbia, vol. i (1905), p. 73.

¹ Holm in "Memoirs Torrey Bot. Club," Vol. II.

shows the following details in natural size :—

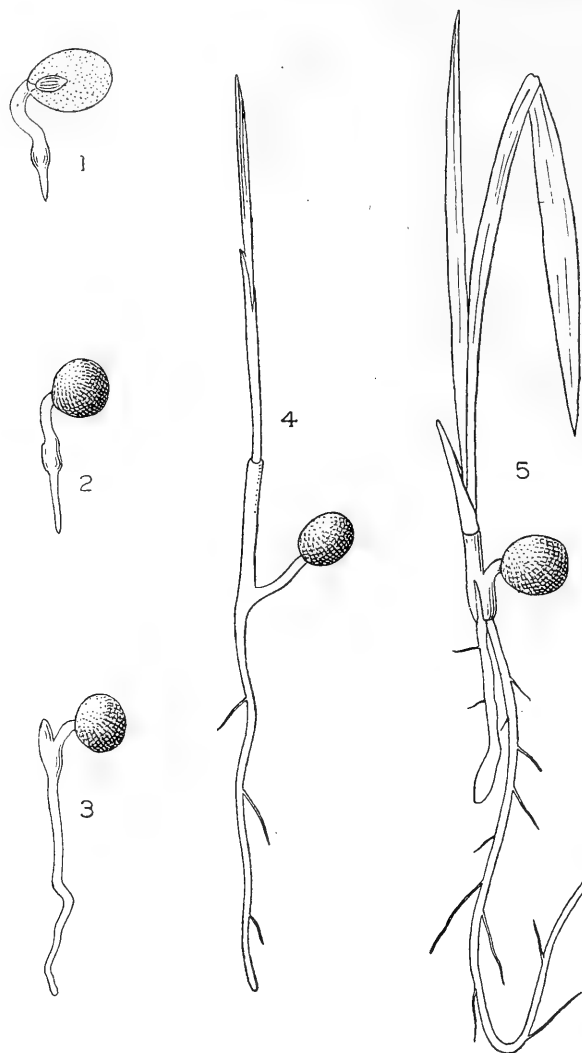


FIG. 16.—Successive stages in the germination of *Nannorhops ritcheiana*.

Natural size. (After Holm).

1. A longitudinal section through a germinating plantlet in the first stage.
2. The same a little older.
3. An older germinating plantlet, where the plumule has commenced to break through.
4. A young plant with two leaves developed and with the fruit still attached.
5. The same, but older, where the primary root has ceased to grow, and the first secondary root has come out.

HABITAT.—Sind, Baluchistan, Punjab, Afghanistan: Abundant in the Peshawar Valley, in Kohat, and in the trans-Indus territory along the eastern skirts of the Suliman range, ascending up to 3,000 feet; on the hills which form the western boundary of Sind; common locally on a limited area in the central Salt range, between 2,500 and 5,000 feet, and on Mount Sakesar; in one place in the Siwalik tract east of the Jhelam, near Sunani above Bhimbur; common in the Khaiber Pass, and generally in the low arid mountains of eastern Afghanistan; everywhere up to 5,000 feet in Baluchistan and Mekran, except near the coast.

FLOWERS.—From August to November; fruit ripens in summer.

USES.—It is a very useful plant in the arid regions where it is common. The stems, leaves, and petioles serve as fuel; the delicate young leaves are eaten as a vegetable; the reddish-brown moss-like wool of the petioles is impregnated with salpeter and used as tinder for matchlocks; the matting made of the leaves is considered to be superior to that made of *Phoenix*; of the leaves and petioles rope is made; the leaves are also made into fans, sandals, baskets, pouches, and brushes: in the trans-Indus country a rude kind of drinking-cup is made of the entire blade, by tying together the tops of the segments; the seeds are pierced, made into rosaries, and exported for that purpose to Mekka via Muskat, from Gwadur on the Baluchistan coast, west of the Indus (Brandis). The leaf-bud or "cabbage," and the young inflorescence, as well as the flesh of the fruit, are commonly eaten.

CULTIVATION IN EUROPE.—This stove-plant grows best in a compost of sandy loam, to which some leaf soil and a little charcoal may be added with advantage. Good drainage is necessary. The palm is propagated by seeds and offsets, if the latter can be procured and detached without injury to the parent plant.

Opinions as to the treatment of this palm seem to be divided. A London Gardener writes that *Nannorhops* is probably one of the hardiest of Fan Palms and that it does not like artificial heat, preferring the temperature of an unheated greenhouse.

We have no practical experience of the cultivation of this palm, but considering the geographical distribution of the species, we should rather say, that it will prefer an unheated greenhouse to the moist temperature of a hothouse.

Beccari mentions two specimens which he is cultivating in the open in the vicinity of Florence, and he says that the plants are doing very well in the northern Mediterranean region.

ILLUSTRATIONS.—We are indebted to Mr. H. V. Kemball, Mr. R. T. Harrison, and Mr. Advani for the following two photographs :

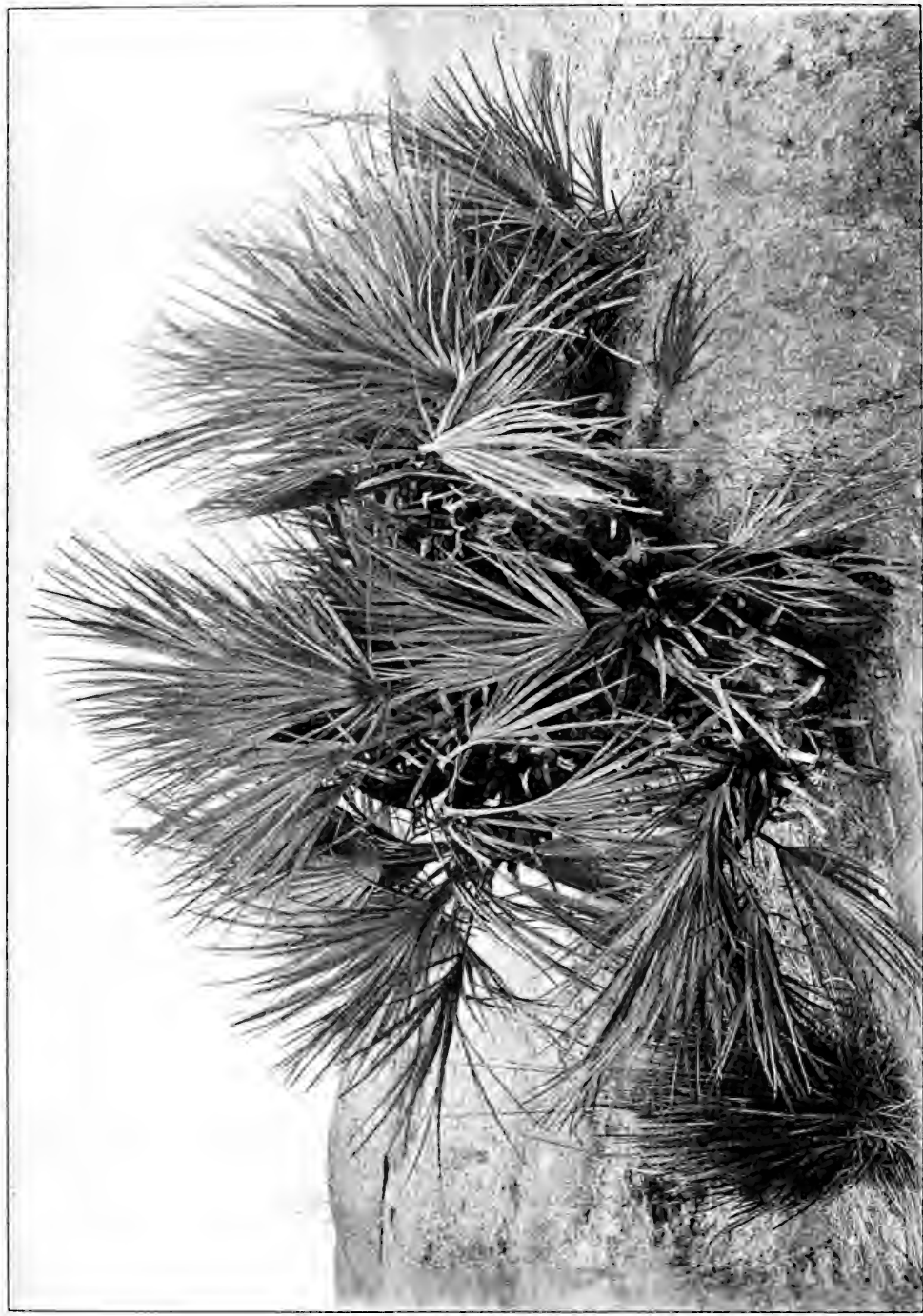
Plate XXI shows a characteristic landscape in Baluchistan with a dense growth of *Nannorhops*. The palms grow in thick small clusters and are about 6 feet high as a rule. The Railway station which is seen in the photograph is the Nakas Railway station, about 5 hours journey from Sibi towards Quetta side.

Plate XXII. A cluster of *Nannorhops* from the same place.

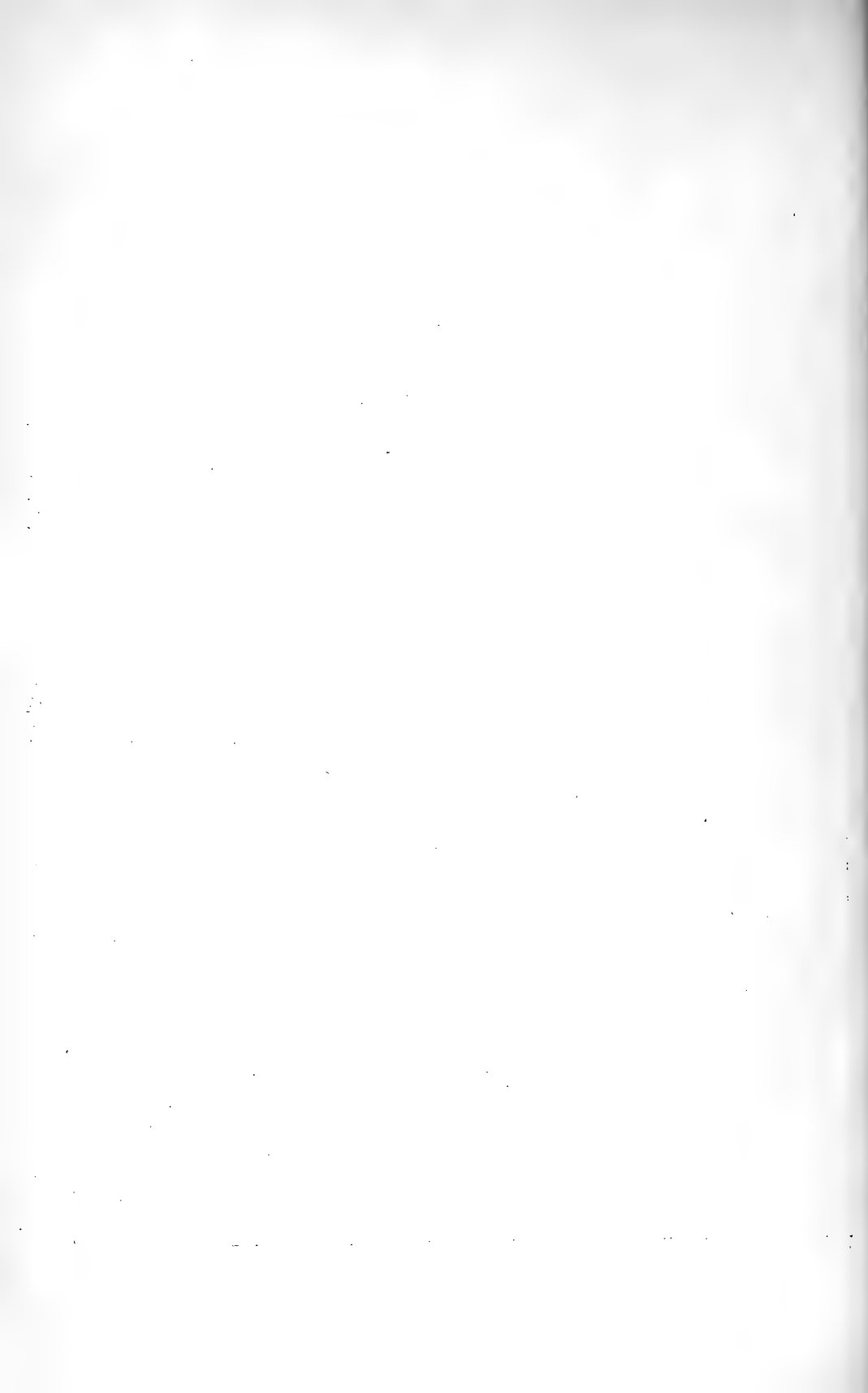
LICUALA, Thunb. Acta Holm. 1782, 84.

Gærtn. Fruct. II, t. 139.—Mart. Hist. Nat. Palm, III, 234, t. 134, 135, 162.—Kunth Enum. Pl. III, 238.—Bl. Rumph. II, 37, t. 82, 88-93, II, 47, t. 94.—Griff., Palms Brit. Ind. 117, t. 221 A, B, C, 224-224 A, B.—Miq. Fl. Ind. Bat. III, 51, suppl. 254, 591.—Kurz For. Fl. II, 527.—Walp. Ann. III, 469, V, 815.—Becc. Males. I, 80.—Wendl. & Drude Linn. 39, 191, t. 3, fig. 2.—Benth. Fl. Austr. VII, 144.—Drude Bot. Zeitg. 1877, 638, t. 6, fig. 36-38.—Benth. & Hook. Gen. Pl. III, II, 928, 96.—Hook. Fl. Brit. Ind. VI, 430.

Low, rarely tall palms ; stems annulate. Leaves more or less orbicular, or flabellate, plicate, deeply partite ; petiole usually spinous. Spadices interfoliar, sheathed by tubular, coriaceous, persistent spathes, simple or branched, glabrous, tomentose or



A CLUSTER OF MAZARI PALMS (*Nannorhops vitchieana*, H. Wendl.).



scurfy ; flowers usually small, scattered, hermaphrodite ; bracts and bracteoles obscure or absent. Calyx cupular or tubular, mouth 3-fid. Corolla-lobes coriaceous, valvate. Stamens 6 ; filaments subulate ; anthers cordate. Ovary of 3 free or nearly free truncate 1-ovuled carpels ; styles filiform ; ovules erect. Drupes small ; style terminal. Seed erect, globose, free, ventral face often hollowed albumen equable ; embryo dorsal.

Species about 50. Asia, Australia, Pacific Islands.

With regard to this genus J. D. Hooker has the following note :—"There are several unnamed Burmese and Malayan-Peninsular species in the Kew Herbarium, which I fail to identify with any of the Indian ones enumerated by Beccari. I refrain from describing them, as they are solitary specimens, and may be the same as known Malayan Island species, of which I have seen no specimens."

CULTIVATION IN EUROPE.—The species of this genus are dwarf stove palms. They grow in a compost of two parts peat and one of sandy loam. They require a strong moist heat. Propagation is effected by seeds sown in a sandy soil, and placed in a strong, moist bottom heat.

* INDIGENOUS SPECIES.

LICUALA PELTATA, Roxb. Fl. Ind. II, 179 ; Ham. in Mem. Wern. Soc. V, 313 ; Griff. in Calc. Journ. Nat. Hist. V, 325 ; Palms Brit. Ind. 120, t. 222 ; Mart. Hist. Nat. Palms. III, 234, t. 162 ; Kunth Enum. III, 238 ; Wall. Cat. 8617 ; Kurz in Journ. As. Soc. Beng. XLIII, II, 204 ; For. Fl. II, 527 ; T. Anders in Journ. L. Soc. XI, 13 ; Gard. Chron. 1872, 1657, fig. 350 ; Fl. Brit. Ind. VI, 430 ; Grah. Cat. p. 225 ; Prain Beng. Pl. 1091 ; Brandis Ind. trees, 656.

NAMES.—Kurud, Kurkuti (Beng.) Patti, Chattah-pat (Ass.) ; Salu (Burm.).

DESCRIPTION.—Stems 8-15 feet high, usually gregarious, marked below with the scars of the fallen leaves, above rough from the persistent bases of the petioles. Leaves orbicular, 3-5 feet in diameter, peltate, 12-30 partite, segments variously connate, many toothed at the apex, teeth $\frac{1}{2}$ -2 inches, very variable in length and breadth, obtusely 2-fid. Petiole 6-7 feet long, triangular, armed throughout along the margins, especially towards the base, with stout, horny, black, very sharp, conical, and rather curved spines. Spadix erect, longer than the leaves, stout, simply branched, sprinkled in the upper parts with brown scurf. Spathes tubular, 6-12 inches long, $\frac{1}{2}$ - $\frac{3}{4}$ inch broad, mouth irregularly toothed or lobed, at length variously split, and similarly scurfy. Spikes 3-5, solitary, 6-12 inches long, nodding-pendulous, centrifugally developed, fulvous-tomentose, adnate to the axis to about the middle of the spathe. Flowers numerous, on short stalks, solitary, very large, of a greenish-white colour, covered externally with the same pubescence as the spike, opening centrifugally. Calyx campanulate, shortly 3-toothed. Petals $\frac{1}{3}$ - $\frac{1}{2}$ inch long, lanceolate, coriaceous, reflexed. Stamens 6; filaments united among each other, and to the corolla as far as the base of its segments, thence free, long, stout, plano-subulate, keeled along the back; anthers linear, cordate, exserted, attached near the middle; otherwise the cells are nearly distinct. Ovary turbites, short, with a depressed apex; carpels cohering by their apices. Ovules solitary, erect, anatropous. Style filiform, slender, 3 times longer than the ovary. Stigma obsoletely 3-toothed, on a level with the anthers. Fruit $\frac{1}{2}$ inch long, ellipsoid, narrowed equally at both ends, orange coloured, one-seeded, apiculate by the persistent base of the style, and crowned with the 2-abortive carpels, surrounded at the base by the perianth, the tube of the calyx resembling a short pedicel. Seed oblong, with the intruded hilar process dilated within. Albumen horny. Embryo dorsal, situated

below the middle. (Fig. 17).

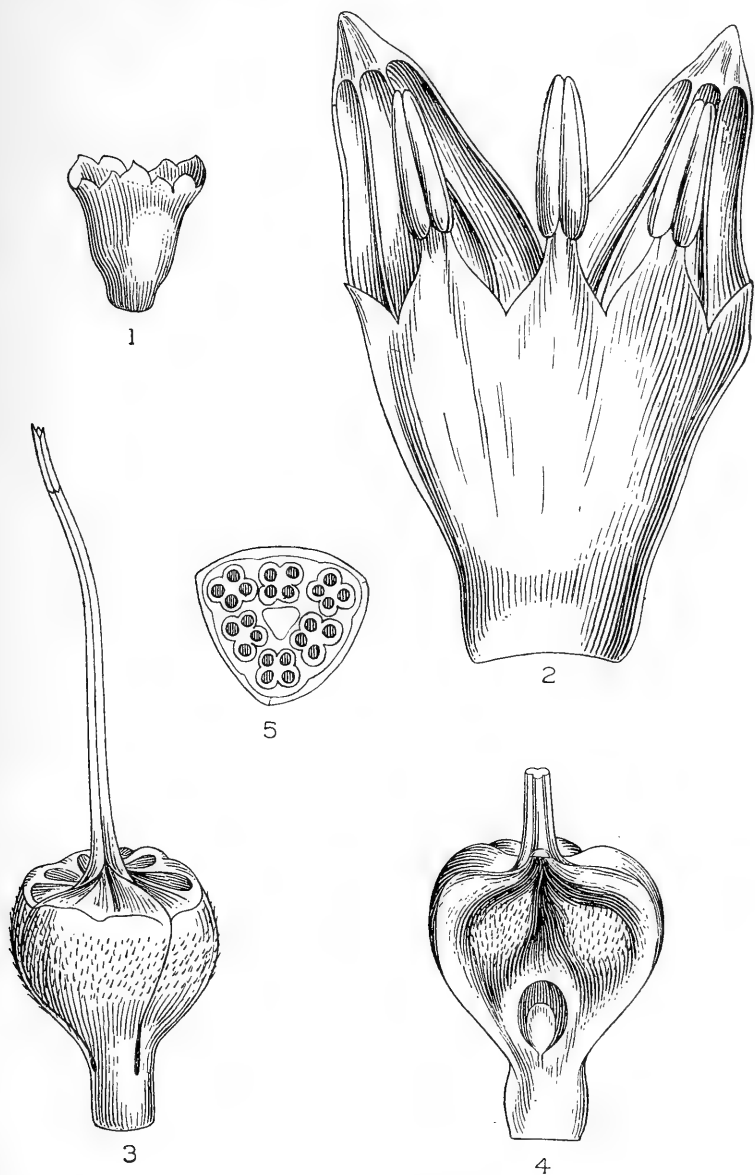


FIG. 17.—*Licuala peltata*.

1. Calyx.
2. Part of corolla spread open with 3 stamens.
3. Pistil
4. Pistil opened, an ovule is visible.
5. A floral diagram after a section through the upper part of the flower.

All much enlarged. (After Martius).

HABITAT.—Sikkim, deep hot valleys near the Teesta river; Assam; Khasia hills; Cachar, woody mountainous country to the east of and near Chitagong. Burma, Upper and Lower, indamp ravines of the Pegu Yoma; Andaman Islands.—Introduced into gardens.

FLOWERS.—In the cold season; fruiting in the hot season.

USES.—The leaves, according to Jenkins, are used for the same purposes as those of the Toko-pat, but are much coarser, and only made use of by the lower orders. The demand for them is very great, scarcely a ploughman, cow-keeper or cooly, but has his hat made of chattah-pat.

ILLUSTRATION.—Plate XXIII shows a fine specimen of *Licuala peltata*. From between the round peltate leaves rise 6 simply branched spadices. The branches resemble large catkins on the photograph. We have to thank Mr. H. F. Macmillan who took the photograph in the Royal Botanic Gardens of Peradeniya.

LICUALA LONGIPES, Griff. in Calc. Journ. Nat. Hist. V. 330; Palms Brit. Ind. 125, t. 224, A and B; Kurz in Journ. As. Soc. Beng. xliii. 204; For. Fl. II. 528; Brandis, Indian Trees 656.

NAME.—Plass Bhatto (Malay.)

DESCRIPTION.—Stem very short. Leaves peltate, orbicular, 3-4 feet in diameter, dark green. Segments about 20, the lateral ones being the narrowest, obliquely cut off, unequally 3-4 lobed, lobes irregularly denticulate the terminal one cuneate, 5 inches broad, truncate, 11-keeled above, with as many short, truncate, broad, bifid, denticulate lobes as there are keels; intermediate ones narrower, generally 3-keeled, otherwise similar; the upper margins of all blackish brown. Petioles stout, 4-5 feet long, trigonous, deeply channelled above, armed (except the upper third) along the two inner angles with stout, horny, conical, tooth-shaped prickles. The rete consists of stout leathery fibres. Spadix stout, much branched, much shorter than the petioles, $1\frac{1}{2}$ -3 feet long, erect, undulate, flexuose. Flowers numerous, sessile, green, sparsely and sometimes densely pubescent. Calyx subcylindrical, 3-toothed, teeth bifid. Corolla almost twice as long as the calyx, divided to a little below the middle into 3 broad, cordate, lanceolate segments. Filaments short, setiform. Anthers cordato-ovate,



KURUD (Beng.), PATTI (Ass.) OR SALU (Burm.) (*Licuala peltata*, Roxb.).



slightly inflexed. Ovary turbinate, towards the base smooth and 3-partible, above entire and villous. Ovule solitary, erect, anatropous. Style cylindric, rather shorter than the ovary, hollow at the apex. Stigmas 3, minute. Fruit seated on the stout pedicel-like tube of the calyx, surrounded at the base by the perianth and annulus of the stamens, apiculate by the style, 1-seeded. Endocarp thin, sub-osseous.

HABITAT.—Tenasserim coast in forests near Laineer to the south of Mergui; Malacca, solitary in dense forests, Ayer Punnus Goonoong Miring, and Mount Ophir, but not above an elevation of a thousand feet.

FLOWERS—Nearly all the year.

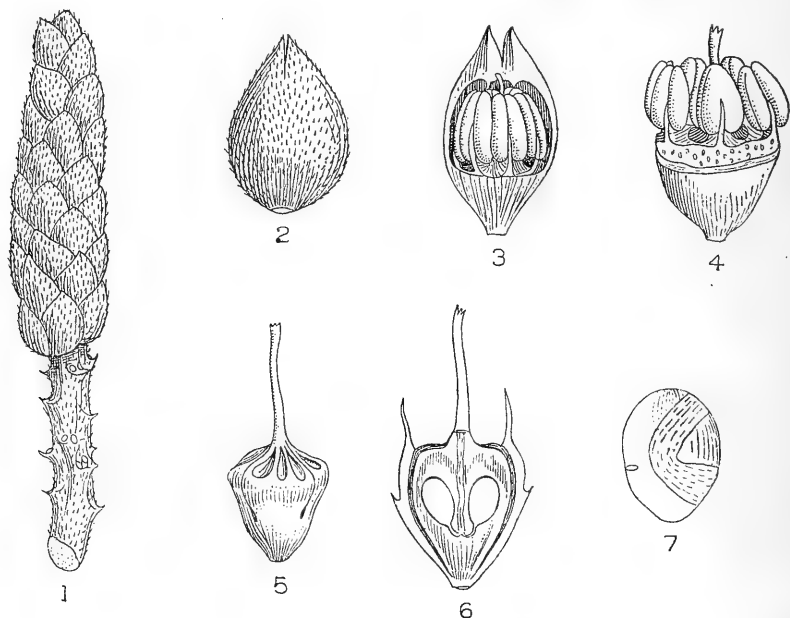
LICUALA SPINOSA, Wurm. in Verh. Bat. Genootsch. II, 469; Roxb. Fl. Ind. II, 181? (excl. syn. Rumph.); Griff. in Calc. Journ. Nat. Hist. V, 321; Palms Brit. Ind. 119; Blume Rumph. II, 39, t. 82, 88; Mart. Hist. Nat. Palm. III, 235, 318, t. 135, 1, 2; Mig. Fl. Ind. Bat. III. 53; Suppl. 254; Becc. Males. III, 74.—*L. paludosa*, Kurz in Journ. As. Soc. Beng. xliii, 528; For. Fl. II, 528.—*L. ramosa*, Bl. in Schult. Syst. VII, 1303; Rumphia II, 39.—*L. horrida*, Blume Rumph. II. 41, t. 89, f. 1; Mart. l. c. 237, 318.—*Corypha pilearia*, Lour. Fl. Cochinch. I, 265.

Beccari has lately reduced to this species his former varieties: *Licuala spinosa* var. *cochinchinensis* and var. *brevidens*. Becc. Malesia III. There would be no end of varieties, he says, if all the different forms of a species so widely distributed were to be described. (Webbia, vol. 3 (1910) p. 240.).

NAME.—Plass (Malay).

DESCRIPTION.—Stems stout, 8-10 feet high, 2-4 inches in diameter, densely tufted, rough with the scars of fallen leaves. Leaves orbicular-reniform, about 4 feet across the broad diameter; pinnules about 18 in number, narrow-cuneate; the central ones about 2 feet long; the terminal one is 10- or 11-plicate, truncate, with as many lobes as there are plaits, the lateral ones are the deepest, all are obtusely bifid, the intermediate ones are more or less truncate, 3-5-lobed, lobes larger and deeper, but otherwise similar to those of the terminal one, the lateral ones with oblique 3-lobed ends. Petiole about 4-4½ feet long, obtusely trigonous, margins armed throughout with stout, conical, somewhat curved spines. Ligule very narrow, 1-1½ inch long, scarious. Spathes

green, sprinkled with brownish scurf, $\frac{2}{3}$ inch in diameter, with scarious, lacerated ends, occasionally obliquely lacerated. Spadix a little longer than the leaves; branches 7-10, adnate to the rhachis as high as the mouths of the spathes; lower branches several, compound, stout, subulate, downy, spreading, generally secund. Flowers sessile, placed in two's or three's, small, nearly ovate. Calyx sub-ovate, divided to the middle into 3-rounded teeth. Corolla a little longer than the calyx, divided below the middle into 3 broad, lanceolate, acuminate segments. Annulus of stamens rather high, nearly entire. Filaments short, setaceous. Anthers oblong-ovate. Ovary depressed, turbinate, sculptured at the apex. Style filiform, rather longer than the ovary. Fruit obovoid, $\frac{1}{4}$ inch long, pedicelled by the calyx-tube, red, 1-seeded, surrounded at the base by the perianth. Seed ovate; albumen horny, on a transverse section horse-shoe-shaped. (Fig. 18).

FIG. 18.—*Licuala spinosa*.

- | | |
|---|--|
| 1. Top of a flowering branchlet before the flowers open. | 4. Stamens surrounding the pistil. |
| 2. Young flower. | 5. Pistil. |
| 3. Corolla, one petal removed to show aestivation of stamens. | 6. Longitudinal section through pistil to show the ovules. |
| | 7. Longitudinal section of seed. |

All enlarged. (After Martius).

HABITAT.—Malacca, common in wet places, particularly in hedges; Andaman Islands, tidal forests; Nicobars; Malay Islands.

FLOWERS (in the Bot. Gard. Calcutta,) in the cold season; fruit ripens in the hot season.

CULTIVATION IN EUROPE.—This palm must be kept in the hot-house, and it is well to remember that in its original home this species grows with preference in calcareous soil.

ILLUSTRATION.—*Licuala spinosa* will be figured later on together with *Sabal mauritiaeformis*.

* * INTRODUCED SPECIES.

LICUALA PALUDOSA, Griff, in Calc. Journ. Nat. Hist. V, 323; Palms Brit. Ind. 118, t. 221, A, B, C; Hook. Fl. Brit. Ind. VI, 430; Becc. Males. III, 74.

DESCRIPTION.—Stem 4-10 feet high, 3-9 inches in diameter, unarmed, almost without marks of rings, except towards the apex where they are incomplete; crown of moderate size. Rete rather stout, of rich brown colour. Leaves flabelliform or orbicular, 3 feet in diameter, 6-9 partite; lateral segments oblique at the apex, deeply and acutely 3-4 lobed, lobes bilobed (except the side ones), the others are more or less truncate, with 4-8 broad, short, bifid lobes; petiole 1-2 feet long, subtrigonal, armed along the margins, except towards the apex, with small, black, horny, conical, curved spines; sheaths very fibrous. Spathes $\frac{3}{4}$ inch broad, tubular, green, with membranous or scarious, lacerated mouths. Spadix very stout, rather curved; branches of the spadix bearing 5 or 7 spikes, which are 4 or 6 inches long, curved, secund, generally nodding, slightly puberulous, often appearing as if they arose separately from within the mouth of the spathe. Flowers solitary, sessile, of a turbinate form; calyx cup-shaped, $\frac{1}{10}$ inch broad, nearly entire, irregularly split at the expansion of the flower; corolla (in bud) urceolate, about $\frac{1}{3}$ longer than the calyx, divided to the middle into 3 cordate-ovate segments. Ring of the stamens white, nearly entire, projecting considerably above the throat of the corolla; filaments short, setiform; anthers

versatile, oblong, pale-brown. Ovary depressed, turbinate, with a horny sculptured apex; carpels adhering by the style; ovules solitary, erect, anatropous; style subulate, rather shorter than the ovary; stigma simple. Fruit spherical, $\frac{1}{4}$ inch in diameter.

HABITAT.—Malacca, low sandy wet places along the sea-coast, about Tanjong Cling, Rundur, and Pulo Bissar, associated with *Pandanus*, *Eugenia*, *Diospyros*, *Helospora*, etc.; Perak; Siam.

Introduced in gardens.

FLOWERS From April to May.

LICUALA ELEGANS, Bl. Rumphia II, 42, tab. 90 A, B.—Becc. Malesia, III, 71.

DESCRIPTION.—Caudex of the thickness of a man's arm, 4 feet long, erect, with transverse scars. Petioles 3-4 $\frac{1}{2}$ feet long, the margins with recurved spines, uppermost part of petiole unarmed. Lamina suborbicular, palmatisect, segments about 20, divided almost to the base, the inner ones 16 inches long, linear-cuneiform with the apex straight-truncate, outer ones shorter, linear-lanceolate, with the apex obliquely truncate, all glabrous. Spadix elongate, 7 feet long, rigid; spathes incomplete, vaginate, striate, pale green. Calyx in smaller unripe fruits cupuliform, in ripe ones more cylindrical, at the base depressed-truncate on a very short, tuberculiform pedicel, teeth broadly-ovate, subacute, striate, persistent. Corolla deeply tripartite, longer than the calyx, with a stamiferous ring. Immature fruit turbinate-globose, yellowish-green, apex discoid-dilate. Berries ellipsoid, surrounded at the base by the persistent perianth, with the apex rounded, glabrous, fleshy, 1-seeded. Putamen ellipsoid-globose, obsoletely mucronate at the base, thin, fragile, whitish, outer side fibrous-striate, inner side smooth. Seed spheric—ellipsoidal. Albumen with a large irregular cavity, solid, cartilaginous, white. Embryo dorsal, transverse.

HABITAT.—Sumatra.

ILLUSTRATION.—Plate XXIV shows a well-developed specimen of *Licuala elegans*. At first sight this species might easily be mistaken for *Licuala peltata* (Plate XXIII). The straight-truncate segments, however, distinguish *L. elegans* from *L. peltata*,



Licuala elegans, Bl.



which even on our picture shows distinctly the many-toothed top of the segments. For other well-marked characters we refer to the description of the two plants.

On the left side of the picture a spadix is visible with the flowering spikes spreading in all directions.

The specimen, taken by Mr. H. F. Macmillan, is growing in the Botanic Gardens of Peradeniya.

LICUALA GRANDIS, H. Wendl. MSS.; André Illustr. Horticol. t. 412; Hook. Bot. Mag. t. 6704 and in Report Kew 1882 (1884) p. 65; Gard. Chron. 1886, 139; Becc. Males. III, 73.—*Pritchardia grandis*, Hort.

DESCRIPTION.—Whole plant about 6 feet high to the base of the topmost petiole; stem leaf-bearing for nearly half of its length, clothed shortly below the leaves with the sheaths of the old leaves, which are semi-amplexicaul and about 3 inches long. Leaves erect and slightly spreading, deep bright green; petiole $2\frac{1}{2}$ -3 feet long, slender, concave-convex, armed with short, stiff, nearly straight or curved, sometimes irregularly forked spines along the margins from the base to the middle, ending in a short, ovate, acute, concave, thickly coriaceous ligule; blade sub-erect, 3 feet in diameter, and about two long, orbicular or semi-orbicular, concave from the incurving of the sides and more or less of the whole blade, closely plaited and a little wavy, base cuneate or truncate, margins cleft into bifid lobes about 1 inch long, lobules of the lobes very obtuse. Spadices several, rising from amongst the leaves and nearly as long as they are, sub-erect; rhachis as thick as the little finger, cylindric, terete, quite smooth, giving off at intervals of a foot or less flowering panicles 5-6 inches long. Spathes at the bases of the panicles, two or more, 2-3 inches long, lanceolate, acute, concave, brown, striate. Flowers $\frac{1}{3}$ inch long, jointed on to very short pedicels or sessile on the branches of the panicle. Calyx tubular-campanulate, terete; mouth truncate, slightly lobed. Petals as long as the calyx, ovate, acute, concave, very thick, with broad margins and an inflexed tip. Stamens very small, inserted between the triangular teeth of a 6-lobed coriaceous cup; filaments subulate, as long as the teeth of the cup; anthers oblong. Ovary

of 3 slightly cohering wedge-shaped carpels, united by a very short entire style; stigma simple. (Fig. 19.)

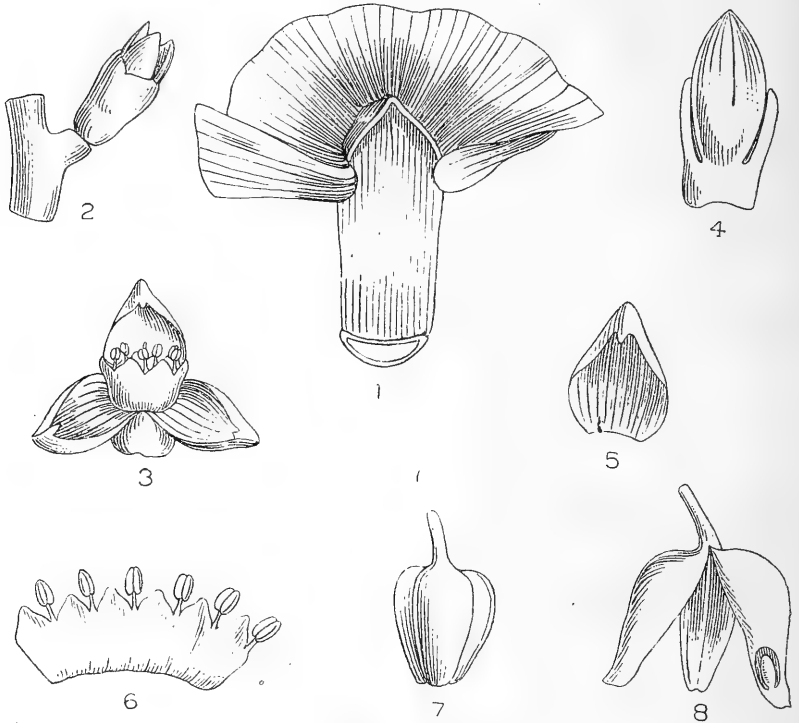


FIG. 19.—*Licuala grandis*, H. Wendl.

- | | |
|---|---|
| 1. Top of petiole and base of leaf blade (nat. size). | 5. Petal. |
| 2. Branch of panicle and flower. | 6. Staminal cup and stamens. |
| 3. Flower spread open. | 7. Ovary. |
| 4. Calyx cut open and petals in bud. | 8. Ovary with the carpels disarticulated. |
- All, except 1, enlarged. (After J. D. Hooker)

Easily distinguished from other species by the spathes not being tubular.

HABITAT.—New Britain.

ILLUSTRATION.—The palm figured on Plate XXV is an old specimen growing in the Botanic Gardens of Peradeniya.

The photograph was taken by Mr. H. F. Macmillan.

(To be continued.)



Licuala grandis, H. Wendl.

THE RESIDENT BIRDS OF THE SAUGOR AND DAMOH DISTRICTS, CENTRAL PROVINCES.

BY

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This is my first attempt at writing on Natural History matters and I hasten to disclaim all pretensions whatsoever to being an ornithologist; I am only very interested in birds. From what I have read I gather that the apparently most common observations, if only accurate and reliable, apart from interesting bird-lovers, can serve to extend general scientific knowledge of the subject.

All that I lay claim to is that what I have observed I have done accurately and such information as I give is reliable and a fact. That my list is incomplete I know and admit; he would be a bold man who for even the most circumscribed locality would not admit the possibility of an omission; but I guarantee every bird in the list is a permanent resident of the Saugor and Damoh districts, to be found, by those clever enough and with sufficient time to spare, breeding there. Most of them I have been able to find myself. Some have eluded, and a few will doubtless continue to elude, my search, and I have a strong suspicion that the Button-Quails, for example, will be among the latter. But I am perfectly satisfied that every bird mentioned does actually breed here.

I should have preferred to restrict this note to my own district of Saugor, but I have included Damoh for the sake of the water birds and accuracy. The fact is, and I do not attempt to explain it, that all the water-birds and waders seem to prefer, while some appear to restrict themselves to, the Damoh district for breeding. I call this odd, and, like Naaman, exclaim "Are not Chandrapur and Dhamoni, lakelets of Saugor, better than all the waters of Damoh?" Nevertheless does the fact remain that, in the three years watching on which this note is based, I have been totally unable to discover any nesting colony of Egrets, Herons, Snake-birds, etc., in the Saugor district. That they do not breed here is practically inconceivable; on the other hand their nesting is not unobtrusive and ought to be discoverable, and having failed to

discover it except in Damoh, where it is multitudinous, that district is included with Saugor as constituting the area to which this note refers.

I have not attempted ordinarily to describe either birds, nests or eggs, for this is done, very excellently, by Oates and Blanford who have throughout been my authorities. In one or two instances I have commented on or added to the information which they give, but my notes are purely topical and my chief object has been simply to record the permanently resident birds of the two districts. My list, which is the result of many miles of tramping and many hours of watching with glasses all over Saugor district and also in Damoh, gives 155 birds as resident and mentions a few more which I have been unable to verify myself. I think a list of, say, 165 birds would practically cover all our resident species.

The local vernacular names which I give differ very considerably from those mentioned in Oates and Blanford as Hindi names, but local variations are, I imagine, the rule rather than the exception. The limitations in nomenclature are striking: some birds have no names at all; in some cases different species of the same genus or family all have well known individual names, *e.g.*, every one of the eight varieties of Larks in the district has its own distinctive name and any native who knows anything about birds at all will not only recognize each name but pick out and differentiate each particular lark from all the others. On the other hand, there are whole different families which have to rest content with one common name; *e.g.*, Bagla, applied indiscriminately and without differentiating epithets to Storks, Herons, Ibises and practically to any long legged wader. I have only given names perfectly well known and in common use in the district.

The subject of birds imitating other birds' calls is very fascinating. My notes mention a case of the King-crow imitating the Shikra, a performance for which the former is well known among the natives, and which is done deliberately and for a definite object. The Harewa, Jerdon's *Chloropsis*, goes even one better, following up the sharp cry of the Shikra with an imitation of the alarm and distress note of the common Bulbul, a combination which will drive every bird in hearing into cover. Mr. Tucker had a tame

Harewa who used to go about the garden repeating this performance whereupon every other bird fled like Catiline who, on the discovery of his conspiracy, "abiit, excessit, evasit, erupit." Apart from these two instances of what is, on the part of the King-crow at any rate, imitation with practical intention and purpose, birds produce the songs of others apparently for amusement. The Larks, Indian Sky-lark, Ganges Sand-lark, Singing Bush-lark, Crested Lark and Sykes's Crested Lark, are all good at imitation, while one of the best of all is perhaps the Rufous-backed Shrike, who when in the mood will imitate one bird after another most beautifully.

My acknowledgments, which I here gratefully record, are due to various people for much valuable help and information; to Mr. Tucker who gave me most material assistance at the beginning, the most difficult time of my observations; to Mr. Chenevix Trench and Mr. Thornhill, both keen naturalists and bird-lovers; and lastly to Maula Baksh, most stalwart of Chaprasis, whose knowledge of local birds, while requiring check, is, like Sam Weller's of London, extensive and peculiar.

N.B.—The first number given against each bird in the following list is the serial number of the bird in the Fauna of British India Series—Birds by Oates and Blanford.

4. (1). CORVUS MACRORHYNCHUS. Jungle Crow.
Pahari or Jangal Kauwa.
7. (2). CORVUS SPLENDENS. Indian House Crow.
Kauwa.
16. (3). DENDROCITTA RUFA. Indian Tree-pie.
Chota Mahuka.
43. (4). MACHLOPUS HAPLONOTUS. Southern Yellow Tit.
Gulsabdaroshan.

Nests in June. Last year I found three nests, two with four and one with five eggs. As Oates and Blanford say the dimensions of the eggs are not recorded. I may mention that these three clutches averaged $.74 \times .55$, excluding one very small egg which only measured $.69 \times .51$.

105. (5). ARGYA CAUDATA. Common Babbler.
Chota Genga.

110. (6). CRATEROPUS CANORUS. Jungle-Babbler.
Genga or Satbhai.

139. (7). PYCTORHIS SINENSIS. Yellow-eyed Babbler.

These are the only Babblers that I know of in Saugor. The large Grey

Babbler (*Argya malcolmi*) and Rufous-bellied Babbler (*Dumetia hyperythra*) might both be expected, but I have not been able to find either myself.

226. (8). *ZOSTEROPS PALPEBROSA*. Indian White-eye.

Motichur.

Nests in May and June. Oates and Blanford say the eggs are "generally two." I have never found two but either four or three, all pale blue without any marks.

243. (9). *ÆGITHINA TIPHIA*. Common Iora.

Chota pilak.

252. (10). *CHLOROPSIS JERDONI*. Jerdon's Chloropsis.

Harewa.

Oates and Blanford give the eggs as "two in number" but I found a nest with three on 3rd June 1909. The usual number is two.

278. (11). *MOLPASTES HÆMORRHOUS*. Madras Red-vented Bulbul.

Bulbul.

I have never seen either the Bengal Red-vented (*Molpastes bengalensis*) or the white-eared Bulbul (*Molpastes leucotis*) though both from their distribution should occur in Saugor.

321. (12). *SITTA CASTANEIVENTRIS*, Chestnut-bellied Nuthatch.

325. (13). *SITTA FRONTALIS*. Velvet-fronted Blue Nuthatch.

I include both these birds on the authority of Mr. Tucker who has seen them both in Saugor throughout the year, though he has not found their nests. I have not myself observed either of these Nuthatches in the district.

327. (14). *DICRURUS ATER*. Black Drongo.

Karanjua.

This is the only Drongo that I have myself seen in Saugor, but Mr. Tucker tells me he has seen the white-bellied Drongo (*Dicrurus caerulescens*) on various occasions at different seasons of the year and though he never found a nest, there is no reason why it should not breed in the district. Mr. Thornhill told me of an amusing incident which he had witnessed in connection with the Black Drongo. King-crow was sitting on a Telegraph wire, and on the ground below a couple of Mynas and a Hoopoe were making investigations. The Mynas had just discovered a nice plump worm over which they were wrangling when suddenly the cry of the Shikra (*Astur badius*) was heard, so unmistakeable that Mr. Thornhill looked about for the little hawk. The Mynas and Hoopoe tarried not for anything of the kind but legged it for all they were worth to the nearest tree, the former dropping their booty in the excitement. There was not, and never had been, any Shikra about but the King-crow, who had imitated its cry, then swooped leisurely down and absorbed the worm. As a matter of fact the King-crow is particularly fond of this little dodge and the natives are well aware of this habit of his. It involves, of course,

a reasoning power which however I am convinced that nobody who knows anything about King-crow will have any difficulty in accrediting him with. There is a curious superstition among the natives that, if a young King-crow in its first flight from the nest alights on the horn of a bullock, the horn will drop off. This may have a parallel in the similar behaviour attributed to the eyes of the guinea pig if you hold the animal up by its tail.

374. (15). *ORTHOTOMUS SUTORIUS*. Indian Tailor-bird.

Piddi.

I have found both the reddish white and the bluish-green eggs of this bird, but the former are much the more common.

384. (16). *FRANKLINIA BUCHANANI*. Rufous-fronted Wren-warbler.
464. (17). *PRINIA SOCIALIS*. Ashy Wren-warbler.
465. (18). *PRINIA SYLVATICA*. Jungle Wren-warbler.
467. (19). *PRINIA INORNATA*. Indian Wren-warbler.

Chitakul.

The latter is the more common of these Wren-warblers, and I have found its nest very distinctly resembling that of the Tailor-bird, so much so that I at first thought the eggs were the blue variety which the Tailor-bird sometimes owns. All of them nest in the rains, in July. As regards the Rufous-fronted Wren-warbler Mr. Tucker has sent me a couple of eggs from a nest found by him in Saugor, and speaks of it as "fairly common;" from the wide distribution given by Oates and Blanford there is no reason why it should not be, but I have not actually come across it myself.

469. (20). *LANIUS LAHTORA*. Indian Grey-Shrike.

Bara latora.

476. (21). *LANIUS ERYTHRONOTUS*. Rufous-backed Shrike.

Majhla latora.

484. (22). *HEMIPUS PICATUS*. Black-backed Pied Shrike.

Chota latora.

488. (23). *TEPHRODORNIS PONDICERIANUS*. Common Wood-Shrike.

I have never seen a Shrike's larder, but on one occasion, on the march in camp, on riding up to investigate a nest in a thick thorn bush, I found close to the nest, which was a new one in process of building, a full-grown lark, fresh killed, impaled through the neck on a long thorn. A pair of Grey Shrikes were in the vicinity, and that the nest belonged to them there was I think no doubt and the responsibility for the murdered lark it was difficult to dissociate from them, but how they managed to catch it I have never been able to imagine. The Grey Shrike nests early in March and April; the other three varieties wait till June and July. The Wood Shrike's nest is very difficult to find, and being very small and always situated, according to my experience, on the upper side of a fairly stout branch, at the junction of a fork, is quite impossible to see from below.

500. (24). PERICROCOTUS PEREGRINUS. Small Minivet.

Râjelâl.

501. (25). PERICROCOTUS ERYTHROPYGUS. White-bellied Minivet.

Safed Râjelâl.

The latter Minivet is not common ; I have only seen it in one place, in the Karta Jungle, and have never found its nest, but Mr. Tucker found one near Rurawan. The small Minivet breeds in April and May. Mr. W. Jesse in his interesting pamphlet on the 'Birds of Lucknow' mentions a very curious fact in connection with this bird, *viz.*, that "with, I think, only one or two exceptions at the most, I have always found nests, whether building or with eggs, in possession of *three* birds, *two* females and one male. What is the exact duty of this second wife I cannot make out." I have looked out for this 'tertium quid' in Saugor but have never seen any sign of her.

508. (26). CAMPOPHAGA SYKESI. Black-headed Cuckoo Shrike.

Chota Bahram.

510. (27). GRAUCALUS MACUL. Large Cuckoo Shrike.

Bahram.

A very common bird, distinguished for its ridiculously inadequate nest, even more insufficient in comparison with the size of its owner than that of the King-crow.

518. (28). ORIOLUS KUNDOO. Indian Oriole.

Pilak.

544. (29). TEMENUCHUS PAGODARUM. Black-headed Myna.

Pawâi Maina.

549. (30). ACRIDOTHERES TRISTIS. Common Myna.

Maina.

555. (31). STURNOPASTOR CONTRA. Pied Myna.

Ablak Maina.

The Pied Myna is nowhere very common but is very generally distributed over the district.

576. (32). CYORNIS TICKELLI. Tickell's Blue Fly-catcher.

Surmai.

598. (33). TERPSIPHONE PARADISI. Indian Paradise Fly-catcher.

Sultana Bulbul.

604. (34.) RHIPIDURA ALBIFRONTATA. White-browed Fantail Fly-catcher.

Chamkul.

All three of these fly-catchers have defeated me at present so far as their eggs go. But Mr. Tucker has found the nest of the white-browed Fantail and also in the gardens behind the Gopalgunj Bazar, which is one of our happy hunting grounds, found one year in June a nest with young of Tickell's Blue Fly-catcher. This latter Fly-catcher is probably more common than it appears to be, for it always haunts thick cover and shade. The Paradise is fairly common in the district while the white-browed

fantail, with its very distinctive and pretty call, which ends so abruptly and always sounds as if the bird had been interrupted about two notes before the end, is very common indeed ; but I have very rarely seen any of these Fly-catchers, and never the white-browed Fantail, in the vicinity of Saugor itself. The white spotted Fantail Fly-catcher (*Rhipidura pectoralis*) ought to be found here, but I have never come across it. I like the legend, due of course to the difference in the colour of the plumage of mature and immature birds, which Sterndale gives in "Seonee" of the Paradise Fly-catcher, or as he calls it the Rocket-bird. It was originally one of the most beautiful birds in Paradise, all white with twelve long plumes and a lovely voice, but meeting a real bird of Paradise it went and complained to Allah that its own beauty was not sufficiently perfect. Whereon Allah became angry and gave sentence that, as they had shewn an evil spirit and had blackened their faces before him, they should become dingy brown birds with black heads but that after a period of this humiliation they should be allowed to resume their white garb with, however, only two of their tail plumes while their faces should always remain black.

608. (35). PRATINCOLA CAPRATA. Common Pied Bush-chat.

Pidda

629. (36). CERCOMELA FUSCA. Brown Rock-chat.

Shâma.

661. (37). THAMNOBIA CAMBAIENSIS. Brown-backed Indian Robin.

Lâlgândi.

663. (38). COPSYPHUS SAULARIS. Magpie-Robin.

Dhayal.

720. (39). PLOCEUS BAYA. Baya.

The lumps of clay, which I have never failed to find inside the weaver-bird's nest, can only be, I think, to weigh the nest and prevent it swinging about too much.

734. (40). UROLONCHA MALABARICA. White-throated Munia.

Churakka.

735. (41). UROLONCHA PUNCTULATA. Spotted Munia.

Sîambâz.

737. (42). STICTOSPIZA FORMOSA. Green Munia.

Harelâl.

738. (43). SPORÆGINTHUS AMANDAVA. Indian Red Munia.

Lâl Munia.

Another series of birds, which, with the exception of the white-throated which breeds all the year round, two females sometimes using and bringing up their broods in the same usually untidy and conspicuous nest, have hitherto eluded my search for their nests. I think they only breed here in the rains.

775. (44). GYMNOHRIS FLAVICOLLIS. Yellow-throated sparrow.

776. (45).
- PASSER DOMESTICUS*
- . House sparrow.

Bammivallah Chiriya.

Why Sparrows should be locally known as the Brahmins among birds I have never been able to discover. It may be, however, because they indent so freely on, in fact practically monopolise, the hospitality which Brahmins offer in the shape of grain and, in the hot weather, water to birds in general. The eggs of the yellow-throated vary considerably but resemble very much those of the English Tree-sparrow.

803. (46).
- MELOPHUS MELANICTERUS*
- . Crested Bunting.

Kālā Chandul.

This handsome little bird is very common, nesting in the loose-built stone walls and houses which abound all over the district.

809. (47).
- COTILE SINENSIS*
- . Indian Sand-martin.

811. (48).
- PTYONOPROGNE CONCOLOR*
- . Dusky Crag-martin.

818. (49).
- HIRUNDO SMITHII*
- . Wire-tailed swallow.

819. (50).
- HIRUNDO FLUVICOLA*
- . Indian Cliff-swallow.

823. (51).
- HIRUNDO ERYTHROPYGIA*
- . Sykes's striated swallow.

Native name for swallows and martins *Avabil*.

All quite common: I have found the nests of all the four latter in large numbers in the Khurai fort, but have not yet come across a breeding colony of the Sand-martins.

831. (52).
- MOTACILLA MADERASPATENSIS*
- . Large pied Wagtail.

Khanjan.

The only permanently resident wagtail I believe in Saugor.

847. (53).
- ANTHUS RUFULUS*
- . Indian Pipit.

Oates and Blanford give the number of eggs as three, but on 21st May 1909, I found a nest with four in the rough grass at the head of Saugor lake, a place where the Pipit and various Larks nest, almost by the dozen.

861. (54).
- ALAUDA GULGULA*
- . Indian Sky-lark.

Bhārat.

866. (55).
- ALAUDULA RAYTAL*
- . Ganges Sand-lark.

Retal.

869. (56).
- MIRAFEA CANTILLANS*
- . Singing Bush-lark.

Aghin.

871. (57).
- MIRAFRA ERYTHROPTERA*
- . Red-winged Bush-lark.

Jhīrjhira.

874. (58).
- GALERITA CRISTATA*
- . Crested Lark.

Ghāgas Chandul.

875. (59).
- GALERITA DEVA*
- . Sykes's Crested Lark.

Chandul.

877. (60).
- AMMOMANES PHENICURA*
- . Rufous-tailed Finch-lark.

Geruwa.

879. (61). *PYRRHULANDA GRISEA*. Ashy-crowned Finch-lark.

Dabkul.

All eight of these larks are common. I do not think the Indian Sky-lark, Ganges Sand-lark and Crested lark breed more than once a year about May. Both the Bush-larks and the squat little Ashy-crowned Finch-lark certainly breed twice, in April and again in August-September. It is curious that Oates and Blanford do not mention that both the Red-winged and the Singing Bush-lark's nest is always domed. The Ashy-crowned Finch-lark likes a guard for its nest, preferably a stout thistle.

895. (62). *ARACHNECETHRA ASIATICA*. Purple Sun-bird.

Phul Sungi.

921. (63). *PIPRISOMA SQUALIDUM*. Thick-billed Flower-pecker.

Both these little birds nest early, about March. I have never found the Sun-birds nest without the little entrance porch. The Flower-pecker's little brown felt woven purse nest with its slit in the side for entrance, and the bottom woven slightly thicker than the rest to keep the sides apart, is the most beautiful example of bird-building that I know.

972. (64). *LIOPICUS MAHRATTENSIS*. Yellow-fronted Pied Wood-pecker.

Chitla Katkola.

976. (65). *LYNGIPICUS HARDWICKII*. Indian Pigmy Wood-pecker.

Chota Katkola.

986. (66). *BRACHYPTERNUS AURANTIUS*. Golden-backed Wood-pecker.

Sonā Katkola.

There are, I believe, the only three Wood-peckers found in Saugor. The first and last are both common, the Golden-backed extremely so. The Pigmy Wood-pecker is not so common and I have not found a nest yet but I imagine they breed like the two other species about March. I have seen the Pigmy hop from branch to branch and also come down to the ground in chase of a flying-insect, a habit I have never seen in the other Wood-peckers.

1008. (67). *THEREICERYX ZEYLONICUS*. Common Indian Green Barbet.

1019. (68). *XANTHOLEMA HÆMATOCEPHALA*. Crimson Breasted Barbet.

Hara Katkola.

The latter is ubiquitous, the former not common. Nest in March-April.

1022. (69). *CORACIAS INDICA*. Indian Roller.

Nilkant.

The Nilkant is a "lucky" bird and on the Daserah day Hindus go out for the express purpose of finding one and it is considered very lucky if the bird is seen flying from right to left. So too old Horace,

"Nec laevis vetet ire picus

Nec vaga cornix."

1026. (70). *MEROPS VIRIDIS*. Common Indian Bee-eater.

Tiltilla.

1027. (71). *MEROPS PHILIPPINUS*. Blue-tailed Bee-eater.

The Blue-tailed is not common. I have only seen it in one place in Saugor, at Dewal in the extreme North-West of the district. It occurs in the neighbouring district of Damoh.

1033. (72). *CERYLE VARIA*. Indian Pied King-fisher.

Chitla Kilkilla.

1035. (73). *ALCEDO ISPIDA*. Common King-fisher.

Chota Kilkilla.

1043. (74). *PELARGOPSIS GURIAL*. Brown-headed Stork-billed King-fisher.

Bara Kilkilla.

1044. (75). *HALCYON SMYENENSIS*. White-breasted King-fisher.

Nila Kilkilla.

The Storked-billed is fairly frequently seen. I am certain that a pair have used the wall of the Saugor fort over the lake for nesting, though I have not been able to discover where. The other three kinds are ubiquitous; they all nest about April and May.

1062. (76). *LOPHOCEROS BIROSTRIS*. Common Grey Hornbill.

Silgilla.

The only Saugor Hornbill, quite common, nests in April. The female can invariably be caught on the nest, has in fact to be removed in order to take the eggs.

1067. (77). *UPUFA INDICA*. Indian Hoopoe.

Navah.

Very common; the nesting hole is always very odorous, but this has nothing to do, as I have heard it suggested, with any natural smell of the bird itself; it merely contravenes, in common however with many other birds, the precept of not fouling its own nest, the peculiarly far-reaching effect being due, I think, to the nest's situation which is always in a hole.

1073. (78). *CYPSELUS AFFINIS*. Common Indian Swift.

Awabil.

1086. (79). *MACROPTERYX CORONATA*. Indian Crested Swift.

Extremely local but in good sized flocks where it does occur. Mr. Thornhill told me that out shooting, observing one of these birds coming constantly to the same branch, he was able from his machán and with his glasses to make out the tiny saucer on the branch which constitutes the nest; it was however quite inaccessible and the eggs of these birds must be difficult to get.

1091. (80). *CAPRIMULGUS ASIATICUS*. Common Indian Night Jar.

Chapka.

I feel certain that there are other Night-jars in the district, but they are not easy to identify without shooting, which, apart from the fact that

I only resort to the gun in sheer desperation when every other means of identification have failed, is not so easy as it sounds when it comes to Night-jars.

1104. (81). *CUCULUS CANORUS*. Cuckoo.

Kuku, or Papaiya.

1109. (82). *HIEROCOCCYX VARIUS*. Common Hawk-Cuckoo.

1118. (83). *COCCYSTES JACOBINUS*. Pied Crested Cuckoo.

1120. (84). *EUDYNAMIS HONORATA*. Indian Koel.

Koel.

1129. (85). *TACCOCUA LESCHENAULTI*. Sirkeer Cuckoo.

All common except the last which I have only seen on a few occasions. I have never found the Cuckoo's egg, though I flatter myself that I have obtained that of the Pied Crested on more than one occasion from the nest of *Crateropus canorus*. But considering how the eggs are said to resemble those of the legitimate owner, I fail to see how one can be certain, short of seeing the Cuckoo on the nest. And I am afraid that my belief in the genuineness of the egg, apart from a slight though appreciable difference in their shade of blue and size, is largely based on my personal desire to believe. The Koel's eggs are easy to get and last year I took a nest with three Koel's and two Crow's eggs. To my great regret I have never been able to witness any dispute or manœuvring between the Koel and the Crow over the depositing of these eggs in the Crow's nest, and I personally have a theory, based on the undoubted fact that at this particular time of year Koels are awake, and most vocally so, at all hours of the night, that Mrs. K. must often introduce the egg stealthily in the dark.

The Sirkeer Cuckoo is a poor creature, hardly worth calling a Cuckoo as he is said to demean himself so far as not only to lay his own eggs, which according to the small boy of the story no decent Cuckoo ever does, but even to make his own nest. I have never found this nest and do not want to or to have anything more to do with this disreputable bird. Swadeshi is all very well but when it comes to self-made nests for Cuckoos, I consider that it is carried to excess.

Mr. Tucker adds the Indian Plaintive Cuckoo (*Cacomantis passerinus*) to the Saugor list, but I have not come across the bird myself.

1130. (86). *CENTROPUS SINENSIS*. Common Coucal or Crow-pheasant.

Mahuka.

Nests late in August, making a large globular nest of green leaves and creepers, always very carefully concealed in the thickest of foliage.

1135. (87). *PALAEORNIS NEPALENSIS*. Large Indian Paroquet.

Karan-tota.

1138. (88). *PALAEORNIS TORQUATUS*. Rose-winged Paroquet.

Tota.

1139. (89). PALÆORNIS CYANOCEPHALUS. Western Blossom-headed Paroquet.

Chota Tota.

The large Indian Paroquet is the most popular cage bird, so much so that contractors regularly pay for the monopoly of the right to take all the young birds to be found in particular tracts of jungle.

1152. (90). STRIX FLAMMEA. Barn-owl or Screech-owl.

Gugu.

The old fort at Dhamoni is full of these owls.

1161. (91). SYRNIUM OCELLATUM. Mottled Wood-owl.

1164. (92). KETUPA ZEYLONSIS. Brown Fish-owl.

Gugu.

A most fearsome bird : I shall never forget seeing one of these owls in a big mango tree which, I promptly climbed in the hope of finding the nest. I found the nest all right with two young ones in a large hollow of the trunk ; it was late in the evening and getting dark and as I climbed both the parent owls watched me, one each side, from a distance of a few feet. With their huge yellow eyes and most truculent aspect in general they were about as terrifying as tigers and I was expecting a 'charge' at any moment.

1180. (93). ATHENE BRAMA. Spotted owlet.

Chipru.

A very common little owl ; it is a most amusing sight to see three or four young ones at the edge of their nesting hole, all glaring and jerkily bobbing and bowing at one like so many little marionettes. I feel sure that there are other species of owls in the district, one of which Mr. Tucker says, is the Jungle owlet (*Glaucidium radiatum*) of which he has seen several pairs. The four above-mentioned are however the only ones I am definitely certain of, and owls, like Nightjars, present difficulties in the matter of identification.

1192. (94). GYPS FULVUS. Griffon vulture.

Gid.

I saw this vulture breeding on a cliff at Mundra.

1196. (95). PSEUDOGYPS BENGALENSIS. Indian White-backed vulture.

Gid.

1197. (96). NEOPHRON GINGINIANUS. Smaller White Scavenger-vulture.

Safed chil.

I believe this is the Saugor vulture and not *Neophron perenopterus*. The latter is said to have the bill dusky, never yellow, and every vulture of this species which I have seen in Saugor has a very distinctly yellow bill. I take this opportunity of warning egg collectors of a dreadful method of defence sometimes adopted by the young of the white-backed vulture, which, when the luckless climber comes within range, deliberately puts its

head over the side of the nest and disgorges on him. Memo: to send up a hireling in future to investigate a Vulture's nest and to stand well from under the tree oneself.

1203. (97). *AQUILA VINDHIANA*. Indian Tawny Eagle.

I took a clutch of two eggs from the nest of this bird in December: she did not desert but proceeded to lay again and I had the second pair of eggs, slightly smaller than the first, taken in January. I believe the bird is still using the same site.

1211. (98). *SPIZAETUS CIRRHATUS*. Crested Hawk-eagle.

A beautiful bird: I have not found it nesting yet, but it is certainly resident.

1216. (99). *CIRCAETUS GALLICUS*. Short-toed eagle.

I have also failed to find this eagle nesting as yet.

1220. (100). *BUTASTUR TEESA*. White-eyed Buzzard Eagle.

Common: nests in April. All eggs found were white unspotted. The peculiar pale yellow eye can be distinguished at a considerable distance.

1228. (101). *HALIASTUR INDUS*. Brahminy kite.

Sankar chil.

1229. (102). *MILVUS GOVINDA*. Common Pariah-kite.

Chil.

1244. (103). *ASTUR BADIUS*. Shikra.

Shikra.

1255. (104). *FALCO PEREGRINATOR*. Shahin Falcon.

Sháhin báz.

Not common, but I have seen it on various occasions and identified it beyond doubt. Have not found it nesting yet.

1257. (105). *FALCO JUGGER*. Laggar Falcon.

Laggar.

I took a clutch of the 4 very handsome eggs of this Falcon, fairly hard set, on 19th February 1909. It is not common in Saugor.

1264. (106). *ÆSALON CHICQUERA*. Turumti or Red-headed martin.

Turumti.

Also not common, and I have as yet failed to secure the eggs. I found a pair building last year but unfortunately for some unaccountable reason they deserted before completing the nest. There are, I think, one or two other species of Raptores in the district and I have had eggs brought to me, undoubtedly Hawk's, which I have been unable to identify.

1272. (107). *CROCOPIUS CHLOROGASTER*. Southern Green Pigeon.

Harial.

1292. (108). *COLUMBA INTERMEDIA*. Indian Blue-rock Pigeon,

Kabutar.

1307. (109). *TURTUE SURATENSIS*. Spotted Dove.

Chitla Fákhta.

1309. (110). TURTUR CAMBAYENSIS. Little Brown Dove.

Fákhta.

1310. (111). TURTUR RISORIUS. Indian Ring-Dove.

Bara Fákhta.

1311. (112). CENOPELIA TRANQUEBARICA. Red Turtle Dove.

Lál Fákhta.

All these pigeons and doves are ubiquitous.

1317. (113). PTEROCLES FASCIATUS. Painted Sand Grouse.

Chapka.

The vernacular name is the same as for the Nightjar with which the natives apparently confuse this bird.

1321. (114). PTEROCLURUS EXUSTUS. Common Sand-grouse.

Bhat titar.

1324. (115). PAVO CRISTATUS. Common Pea-fowl.

Mor.

1350. (116). GALLOPERDIX LUNULATA. Painted Spur-fowl.

Jangli murghi.

I have never seen the Red Spur-fowl (*Galloperdix spadicea*) in Saugor, and do not think he exists here.

1356. (117). COTURNIX COROMANDELICA. Black breasted or Rain-quail.

Bater.

1357. (118). PERDICULA ASIATICA. Jungle Bush-quail.

Chota Bater.

1358. (119). PERDICULA ARGUNDA. Rock Bush-quail.

There are other points of distinction but for the ordinary person the main distinction between these two Bush-quails lies, as Hume points out, in the chin.

"It is difficult to represent colours accurately in words, but bright chestnut (the Jungle Bush-quail) and dull rufous, slightly suffused in many specimens with a grey shade (the Rock Bush-quail) are so different that the colouration of the chin and throat ought alone to suffice to distinguish adults, at any rate, of the two species."

1373. (120). FRANCOLINUS PICTUS. Painted partridge.

Kálú Titar.

In the Saugor Gazetteer Colonel Sutherland, I.M.S., mentions the Black Partridge (*Francolinus vulgaris*) as one of the Saugor birds. He tells me that he has undoubtedly seen this species in Saugor, but it was some years ago. I myself have never seen it, though constantly on the look-out, more especially when in camp on our North border, for the Black Partridge is certainly found in Jhansi. Mr. Thornhill however shot a Black Partridge cock by the Garoula Tank in November 1909, and the identification being beyond doubt, the Black Partridge may perhaps still be included among the Saugor resident species, though it is certainly extremely rare.

1375. (121). *FRANCOLINUS PONDICERIANUS*. Grey Partridge.

Gora Titar.

1382. (122). *TURNIX PUGNAX*. Bustard-quail.

1383. (123). *TURNIX DUSSUMIERI*. Little Button-quail.

Lawa.

1384. (124). *TURNIX TANKI*. Indian Button-quail.

Starting with the Sand-Grouse, I believe this to be a complete list of the resident game birds of Saugor. I have found the nests of all with the exception of the two Button-quails, the discovery of which seems to me a matter of pure luck and to depend on the size of one's boots (extra size policeman's should be well adapted for quail nesting) as much as on anything else, and I still live in hopes of treading on one some day.

The lesser Florican (*Sypheotis aurita*) has been seen, but extremely rarely, in Saugor, and there is certainly not enough evidence to call it a resident.

1400. (125). *AMAUROORNIS AKOOL*. Brown Crake.

Mr. Thornhill found this Crake with young at the end of June. Oates and Blanford mention "some young birds from Saugor in the Hume collection."

1401. (126). *AMAUROORNIS PHENICURUS*. White breasted water-hen.

Jal murghi.

1402. (127). *GALLINULA CHLOROPUS*. Moorhen.

Jal murghi.

I do not think the Coot (*Fulica atra*) breeds in Saugor.

1409. (128). *GRUS ANTIGONE*. Sarus.

Saras.

The Sarus usually breeds in the rains, about August, but Mr. Thornhill found a nest two years running by the Saugor lake in March.

1418. (129). *EDICNEMUS SCOLOPAX*. Stone-curlew.

I found two eggs of this bird in August 1909. It makes no nest at all.

1419. (130). *ESACUS RECURVIROSTRIS*. Great Stone-Plover.

The local Vernacular name for any kind of Plover is Titirri. The great Stone Plover is known as the Billiwallah-Ankh-Titirri or cat-eyed Plover. It makes no nest, lays its two handsomely marked eggs from March to May.

1422. (131). *CUSORIOUS COROMANDELICUS*. Indian Courser.

1428. (132). *METOPIDIUS INDICUS*. Bronze winged Jacana.

Languria.

1429. (133). *HYDROPHASIANUS CHIRURGUS*. Pheasant-tailed Jacana.

Safed Languria.

Both Jacanas are common, but their floating nests and beautiful glossy eggs take a lot of finding.

1431. (134). *SARCOGRAMMUS INDICUS*. Red-wattled Lap-wing.

1432. (135). *SARCOPHORUS MALABARICUS*. Yellow-wattled Lap-wing.
 1447. (136). *ÆGIALITIS DUBIA*. Little Ringed-Plover.
 1488. (137). *ROSTRATULA CAPENSIS*. Painted Snipe.

Rāja cháh.

Quite common : I found three nests, all within 100 yards, on Saugor lake last year. The ground colour of the eggs is usually yellowish stone colour but I found one clutch distinctly greenish, covered with the usual large blotches.

1504. (138). *STERNA MELANOGASTER*. Black-bellied Tern.
 1528. (139). *PHALACROCORAX JAVANICUS*. Little Cormorant.
 1529. (140). *PLOTUS MELANOGASTER*. Indian Darter or Snake-bird.
 1541. (141). *IBIS MELANOCEPHALA*. White Ibis.
 1542. (142). *INOCOTIS PAPILLOSUS*. Black Ibis.
 1545. (143). *PLATALEA LEUCORODIA*. Spoon Bill.
 1552. (144). *PSEUDOTANTALUS LEUCOCEPHALUS*. Painted Stork.
 1553. (145). *ANASTOMUS OSCITANS*. Open-bill.
 1554. (146). *ARDEA MANILLENSIS*. Eastern Purple Heron.
 1555. (147). *ARDEA CINEREA*. Common Heron.

Hérons are very careless nurses : I found quite a considerable number of young birds underneath the tree occupied by one colony and had to put an end to one or two which had survived but been injured by the fall.

1561. (148). *HERODIAS GARZETTA*. Little Egret.
 1562. (149). *BUBULCUS COROMANDUS*. Cattle Egret.

The Egrets, as I have already observed, seem to prefer the waters of the adjoining Damoh district for breeding purposes and I have had some happy days over there with Mr. Trench visiting various colonies. The value of the Little Egrets plumes is well known, and one colony we visited we were glad to find was under the protection of the village landlord, the birds being unmolested and the plumes only collected on their moulting. But this was not always the case, and the attention of the District Magistrate being drawn to the matter I am glad to say that all Egret colonies in Damoh are now under magisterial protection. A tree with an Egret colony looks as if it had been heavily snowed on, and to see the birds fluffing out their plumes is worth going a long way.

1565. (150). *ARDEOLA GRAYI*. Pond Heron.

Baglá.

'Bagla' is the local name for all birds of this shape, Herons, Egrets, even Ibises being included. The Pond Heron, or more familiarly Paddy bird, affords in Saugor an extraordinary instance of the temporary loss, during the breeding season, of all fear of human Society, its chosen nesting site being the tall trees by the Gopalganj Police Station. The Paddy-bird has evidently not heard of the Mackarness pamphlet on the Indian Police, or it would hardly choose such a dangerous neighbourhood for a nursery.

1567. (151). BUTORIDES JAVANICA. Little Green Heron.

Oates and Blanford describe this Heron as "less nocturnal than the Bitterns and may occasionally be seen fishing in the day time in shady places." So far as I have seen it, I should call it a most ordinarily diurnal bird, but this perhaps was due to the fact that it was nesting at the time.

1584. (152). SARCIDIORNIS MELANOTUS. Comb Duck.

Nakta.

1589. (153). DENDROCYCNA JAVANICA. Whistling Teal.

Chillonia.

1591. (154). NETTOPUS COROMANDELIANUS. Cotton Teal.

Bhujakiya.

The first and last of these have steadily defeated every attempt to find their nests, though that they breed here is absolutely certain. The nearest I have got to the Cotton Teal was to find a nest, in a hole in a tree, at Khurai from which the young had recently flown.

1617. (155). PODICIPES ALBIPENNIS. Indian Little Grebe or Dabchick.

Charcharia or Pandubi.

For some reason or other they do not approve of the Saugor lake as a nursery site; seen there in quantities up to July, they then one and all unobtrusively disappear to other more favoured spots.

There are one or two other water birds, rails I think more specially, which ought to be included in this list, but which I have at present failed to locate with sufficient certainty.

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA

BY

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XIV.

(Continued from page 736 of Volume XX.)

PTEROPHORIDÆ.

Deuterocopus, Z.

I think that Mr. T. Bainbrigge Fletcher in his recent paper on this genus (Trans. Ent. Soc. Lond., 1910) has not yet got to the bottom of the difficulties connected with it. The whole subject cannot be discussed here, but I consider that the two following forms are truly and recognisably distinct from *socotranus* and from each other. It will greatly assist the study of the genus if collectors, who come across a species in plenty, will take a good series of specimens at the same place and time, which can be relied on as specifically identical, and also ascertain the species of vine which they frequent.

Deuterocopus viticola, n. sp.

♂ ♀. 9-10 mm. Head and thorax ochreous-brown sprinkled with dark fuscous, face more ochreous, thorax beneath yellowish-white. Palpi whitish, second and terminal joints each with two ferruginous bands more or less sprinkled with dark fuscous. Antennæ black lined with white, ciliations in ♂ $\frac{1}{3}$. Abdomen ferruginous-ochreous more or less suffused with brown, basal segment with two white spots, second segment forming a darker brown band, its posterior margin mixed with white, behind this with two interrupted white lines, beneath yellowish-white with a usually interrupted slight ferruginous bar on margin of third segment. Legs brown more or less irrorated with dark fuscous, with indistinct rings of white irroration. Forewings with lower cleft $\frac{2}{3}$ of upper; ferruginous-brown, variably irrorated with dark fuscous; two or three white scales at base of upper cleft; the dark irroration forms a patch on base of first segment and an inwardly oblique fascia at its middle, between and beyond which the segment is suffused with fulvous-ochreous; second segment with a transverse fine median line of a few white scales: cilia bronzy-fuscous, faintly rosy-tinged, slightly mixed with white scales on basal $\frac{2}{3}$ of upper cleft and basal half of lower, beyond this with a dark fuscous patch on upper margin of second and third segments reaching apex, and on lower margin of all segments extending to apex and limited by a gently curved colinear (subcontinuous) black basal line at apex of each segment, but on two upper

segments cut by a single white scale near before apex, on dorsum with a blackish scale-projection just beyond cleft, at apex of wing with a blackish bar, on costa brownish-ochreous with a dark fuscous patch on middle of first segment. Hindwings dark fuscous, tinged with crimson anteriorly, and near base with ferruginous; cilia rosy-fuscous, on dorsum with a small triangular blackish scale-projection just before middle of third segment, and a large circular blackish scale-projection occupying its apex on both margins.

Hambantota and Puttalam, Ceylon (Pole, Fletcher); in October and November, eight specimens. This is the form bred in plenty by Mr. Fletcher from larvæ feeding on flowers of *Vitis quadrangularis*; it is the commonest Ceylon form (I have seen numerous specimens besides those here described), but possesses characters which I have never met with in examples from other localities. Mr. Fletcher includes it in his account of *socotranus*, but together with what I regard as heterogeneous material from various regions.

Deuterocopus alopecodes, n. sp.

♂ ♀. 10-11 mm. Head and thorax ferruginous sprinkled with dark fuscous, thorax beneath whitish-yellow. Palpi whitish, second and terminal joints each with two ferruginous bands. Antennæ black, lined and dotted with white, ciliations in ♂ $\frac{1}{2}$. Abdomen ferruginous, basal segment with two small white spots, posterior margin of second segment somewhat mixed with white, two or three pairs of white dots or slight marks on posterior segments, beneath whitish-yellow with well-marked entire deep ferruginous band on posterior margin of third segment. Legs ferruginous banded with dark fuscous suffusion on whorls, and more or less obscurely ringed with white. Forewings with lower cleft over $\frac{2}{3}$ of upper; ferruginous, variably irrorated with dark fuscous; the dark irroration forms a patch on base of first segment and a band at its middle, latter sometimes hardly marked, its margins sometimes indicated by a few white scales; two or three white scales on second segment beyond its middle: cilia golden-bronzy, slightly mixed with white scales on basal $\frac{2}{3}$ of upper cleft and basal half of lower, beyond this with a patch of dark fuscous suffusion on upper margin of second and third segments reaching apex, and on lower margin of all segments separated by a pale patch from a blackish downwards-directed triangular apical scaleteeth, most distinctly on second and third segments, outer edge of apical scaleteeth nearly straight but dislocated and not in the same line, on dorsum with a slender blackish scale-projection just beyond cleft, at apex of wing with a blackish bar, on costa ferruginous-ochreous with a blackish patch on middle of first segment. Hindwings dark fuscous, third segment ferruginous; cilia golden-bronzy, sometimes rosy-tinged, on dorsum with a small triangular scaleteeth of ferruginous and black scales before middle of third segment, and a large angular

suboblong projection of black and ferruginous scales occupying its apex on both sides, with its lower margin triangularly emarginate.

Karwar, in August (Maxwell); five specimens. Mr. Maxwell, who is at present in England, informs me that these were all taken from a single vine-plant on which the species was plentiful, and that he will be able to ascertain its name on his return.

Marasmarcha phlyctaenias, n. sp.

♂ ♀. 16-20 mm. Head ochreous-whitish, face and crown somewhat infuscated. Palpi moderately long, slender, ochreous-whitish, terminal joint with dark fuscous lateral line. Antennæ light greyish-ochreous, ciliations in ♂ $\frac{1}{4}$. Thorax ochreous-whitish finely sprinkled with fuscous. Abdomen ochreous-whitish, with indications of pale brownish-ochreous stripes. Forewings cleft from $\frac{2}{3}$, segments acute, first moderate, second narrower (but much less narrow than in *atomosa*); whitish-ochreous, tinged with fuscous except towards dorsum anteriorly, more infuscated on posterior half, sometimes with a few scattered dark fuscous scales; three more or less marked cloudy roundish discal spots of dark fuscous irroration, viz., towards dorsum at $\frac{1}{4}$, towards costa at $\frac{1}{3}$, and before cleft: cilia pale whitish-ochreous, grey on outer $\frac{2}{3}$, beneath apex of each segment with an irregular blackish scale-tooth, above apex of second with a short blackish subbasal line, on lower margin of first segment with three blackish specks, on dorsum with several irregular undefined groups of black specks. Hindwings with segments slender, acute; dark grey; cilia pale ochreous-grey, on dorsum with a series of scattered black scales from base to beyond middle.

Puttalam and Trincomali, Ceylon (Pole, Fletcher); N. Coorg, 3,500 feet (Newcome); from October to December, seven specimens. Closely allied to *atomosa*, but readily distinguished by the different colour and considerably broader segments of forewings. It has however hitherto been confused with *atomosa*, and most records of that species from Ceylon are probably referable to *phlyctaenias*, but I have a specimen of *atomosa* from Peradeniya.

ORNEODIDÆ.

Orneodes panduris, n. sp.

♀. 18-20 mm. Head ochreous-white. Palpi moderately long, ascending, with appressed scales, terminal joint $\frac{2}{3}$ of second, ochreous-whitish, second joint slightly sprinkled with dark fuscous. Antennæ whitish-ochreous. Thorax whitish-ochreous. Abdomen whitish-yellow-ochreous. Forewings light ochreous-yellow, crossed by five rather curved cloudy whitish rather thick lines, second and third enclosing a moderate median fascia hardly darker than ground colour, widest on third segment; a small whitish spot on costa between third and fourth; fourth line expanded on first two segments, and sometimes confluent with fifth on costa: cilia light ochreous-yellowish, with obscure whitish bars on lines, on median fascia

greyish. Hindwings light ochreous-yellow, with four thick curved whitish lines, first two enclosing a moderately broad slightly darker antemedian fascia; cilia as in forewings, greyish on antemedian fascia.

Palni Hills (6,000 feet), and Gooty (Campbell); two specimens.

Orneodes lyrastis, n. sp.

♂ 13 mm. Head white sprinkled with dark fuscous. Palpi moderately long, subascending, second joint thickened with dense scales angularly projecting at apex beneath, dark fuscous sprinkled with white, terminal joint $\frac{2}{3}$ of second, rather thick, white with dark fuscous median band. Antennæ whitish-fuscous. Thorax grey sprinkled with dark fuscous and white. Abdomen with basal segment dark fuscous, marked with white on posterior margin, next four segments blackish, with margins somewhat marked with white, remainder ochreous-whitish with a few blackish scales. Forewings ochreous-whitish closely irrorated with dark fuscous; three blackish marks along costa on anterior half, terminated at each extremity by fine white strigulae; a moderately broad nearly straight median fascia, edged with dark fuscous and then with fine white lines, slightly angulated near costa, widest on sixth segment; a subquadrate dark fuscous spot on costa beyond this, with white lateral margins which are curved round on costa so as to be continuous with preceding and following white lines; a moderate straight dark fuscous subterminal fascia, edged with fine white lines; a blackish dot at apex of each segment: cilia pale fuscous, with whitish bars on lines, on median and subterminal fasciae dark fuscous, on space between these pale yellowish between second and third segments, and between fourth and sixth. Hindwings whitish, with scattered dots of dark fuscous irroration; basal area irrorated with dark fuscous up to a moderately broad blackish antemedian fascia edged with white, remainder of first two segments also irrorated with dark fuscous, with two white dots: cilia fuscous mixed with dark fuscous and barred with whitish, on segments 3-6 whitish on posterior half with light fuscous bars towards apex.

Khasis, in May; one specimen.

TINEIDÆ.

Nepticula polydora, n. sp.

♂. 3 mm. Head pale yellowish. Antennæ grey, eyecaps yellow-whitish. Thorax dark grey. Abdomen grey. Forewings lanceolate; dark shining purplish grey; a somewhat oblique bright silvery-metallic fascia at about $\frac{2}{3}$, preceded by blackish irroration, apical area beyond this wholly suffused with blackish irroration: cilia grey mixed with blackish, outer half silvery-whitish, on tornus with a silvery-metallic patch posterior to fascia, but connected with it. Hindwings and cilia grey.

Peradeniya, Ceylon (Green); in April, one specimen. Characterised by the small size, and silvery ternal patch in cilia.

Nepticula sporadopa, n. sp.

♂. 5 mm. Head brown. Antennæ pale greyish-ochreous, eyecaps ochreous-whitish slightly speckled with dark fuscous. Thorax whitish mixed with grey and dark fuscous. Abdomen greyish. Forewings lanceolate; whitish-ochreous, sprinkled with dark fuscous, with a slight purple gloss; a small undefined spot of black irroration in disc beyond middle: cilia on basal half whitish-ochreous sprinkled with dark fuscous, outer half whitish. Hindwings and cilia pale grey.

Trincomali, Ceylon (Fletcher), in June; one specimen.

Opotegea epistolaris, n. sp.

♂. 8-9 mm. Head, antennæ, and thorax white. Abdomen pale prismatic grey. Forewings lanceolate; white; a semi-oval dark fuscous spot on middle of dorsum; a minute black dot at apex: cilia pale ochreous, towards tornus whitish, on costa with two or three oblique fuscous lines at and near base from $\frac{3}{4}$ to apex. Hindwings pale grey; cilia whitish-grey.

N. Coorg, 3,500 feet, in May (Newcome); two specimens.

Crobylophora siglias, n. sp.

♀. 8 mm. Head, thorax, and abdomen white, occipital tuft small. Antennæ whitish, eyecap white. Forewings lanceolate, apex caudulate; shining white; three dark fuscous strigulæ from posterior half of costa, faintly edged posteriorly with pale yellowish; a round raised bronzy-leaden-metallic spot on tornus, marked anteriorly with a small black dot, and surrounded by some pale ochreous-yellowish suffusion: cilia white, on costa ochreous-whitish with an oblique dark fuscous subbasal line terminating at apex and a shorter fuscous line above this towards apex, on termen with a patch of light ochreous-yellow suffusion. Hindwings and cilia white.

Khasis, in April; one specimen.

Leucoptera sphenograptæ, n. sp.

♂ ♀. 6-7 mm. Head, thorax, and abdomen white. Antennæ grey, basal joint white. Forewings lanceolate, apex caudulate; shining white; an oblique dark grey strigula from middle of costa terminating in an oblique elongate light ochreous-yellow anteriorly grey-edged spot which extends from near costa to disc at $\frac{3}{4}$; a light ochreous-yellow triangular spot on costa at $\frac{3}{4}$, preceded by a dark grey oblique strigula; a light ochreous-yellow patch extending along termen; a round black apical dot: cilia white, on costa with two short direct grey bars, round apex whitish-ochreous beyond a short blackish subbasal line, with two diverging grey bars, on termen yellowish at base within a fine subbasal line of grey irroration. Hindwings and cilia white.

Mooltan (Manders), Pusa (Lefroy), in April and May; seven specimens. Bred from larvæ mining blotches in leaves of *Dalbergia sisso* (Lefroy).

Lyonetia melanochalca, n. sp.

♂ ♀. 8-11 mm. Head silvery-white, crown silvery-grey, apparently

without tuft. Palpi moderately long, white. Antennæ whitish. Thorax silvery-grey. Abdomen whitish. Forewings very narrow, elongate-lanceolate, acutely pointed, caudulate; pale ochreous-yellowish; a coppery-bronze patch occupying basal $\frac{2}{5}$ of wing, longitudinally streaked with blackish suffusion in disc, brassy-metallic towards dorsum and posterior edge, which is inwardly oblique from costa; an inwardly oblique brassy-metallic fascia beyond middle, marked with two black longitudinal dashes, and terminating above in a black subcostal line which runs to near apex; a brassy-metallic streak along termen, edged above with a black line except near apex; a black apical spot: cilia grey, at apex with a blackish hook-projection and another less marked beneath it, on costa wholly white. Hindwings rather dark grey; cilia grey.

Khasis, in October; two specimens.

Lyonetia praeifulva, n. sp.

♂ ♀. 8-11 mm. Head, palpi and thorax white, occipital tuft moderate. Antennæ dark grey, eyecap white. Abdomen grey. Forewings very narrow, elongate-lanceolate, acutely pointed, caudulate; shining white; a ferruginous-brown apical blotch, its anterior edge strongly convex, margined by a suffused dark fuscous streak running from costa beyond middle to tornus, where it is sometimes enlarged into a triangular spot; a round black apical dot mostly in cilia: cilia grey, on costa with three dark fuscous bars preceded by spots of whitish suffusion, at apex with projecting blackish bar and an oblique one below it, on termen with a blackish subbasal line. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon (Pole); Khasis; from March to June, and from October to December, eight specimens.

Prytaneutis, n. g.

Head smooth; tongue absent. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint dilated with scales so as to form a moderate eyecap. Labial palpi short, drooping, filiform, pointed. Maxillary palpi rudimentary. Posterior tibiae clothed with very long fine hairs above. Forewings with 3 absent, 4 absent, 6 and 7 stalked, 7 to costa, 10 absent, 11 from before middle. Hindwings under $\frac{1}{2}$, linear, cilia 6; transverse vein absent between 2 and 5, 3 absent, 4 absent, 5-7 approximated at base.

Allied to *Lyonetia*, which however has the antennæ always longer than forewings.

Prytaneutis clavigera, n. sp.

♂ ♀. 8-11 mm. Head and palpi white. Antennæ grey, basal joint white. Thorax whitish-grey, in ♂ with an expansible tuft of long fine hairs from beneath hindwings. Hairs of posterior tibiae whitish-ochreous. Forewings elongate-lanceolate, apex caudate, rather upturned; pale glossy purplish-grey; costal edge white from base to an oblique white strigula at $\frac{2}{3}$, reaching half across wing; a longitudinal orange-yellow mark in disc beneath this

strigula; apical area beyond this dark yellowish-grey, marked with two converging white wedge-shaped costal strigulae; a round black apical dot, edged on costa with white: cilia lilac-grey, on costa whitish barred with dark grey, at apex with two diverging blackish hooks, beneath apex suffused with whitish within a blackish sub basal line. Hindwings grey; cilia yellowish-grey-whitish.

Maskeliya, Ceylon (Pole); in January and April, three specimens.

Opogona orchestris, n. sp.

♂. 11 mm. Crown dark purple-fuscos, fillet, face, and antennae ochreous-whitish. Palpi ochreous-whitish, externally with a streak of fuscous suffusion on upper part of second joint, and terminal joint except apex. Thorax dark purple-fuscos. Abdomen grey, anal tuft whitish-ochreous. Posterior tarsi with whorls of bristles at apex of joints. Forewings elongate-lanceolate, apex acutely produced; bright brassy-yellow; a dark purple-fuscos basal patch, occupying about $\frac{1}{4}$ of wing, edge somewhat angulated below middle; an irregularly triangular dark purple-fuscos blotch extending on dorsum from origin of cilia to middle of termen, and reaching costa at $\frac{3}{4}$, its anterior edge very oblique, somewhat indented in middle and convex near dorsum: cilia grey, becoming pale yellowish on costa. Hindwings rather dark grey; cilia grey.

Hakgala, Ceylon, in April (Green); one specimen.

Opogona dramatica, n. sp.

♀. 10 mm. Head and thorax rather dark bronzy-fuscos, face and antennae ochreous-whitish. Palpi ochreous-whitish, externally with a dark fuscous streak. Abdomen rather dark fuscous, on sides and beneath pale ochreous. Forewings elongate-lanceolate, apex acute; clear light yellow; a dark purple-fuscos streak along costa from base to $\frac{1}{3}$; posterior half dark purple-fuscos, its anterior edge vertical, with short triangular projections in and above middle, enclosing a small triangular spot of ground-colour on costa at $\frac{3}{4}$; cilia fuscous. Hindwings rather dark fuscous; cilia fuscous.

Khasis, in August; one specimen.

Opogona semisulphurea, Stt.

This species must apparently be regarded at present as distinct from the Javanese *dimidiatella* Z., which is only known from the original example the latter differs however only in the somewhat inward inclination of the median dividing line, and the distinction may ultimately prove not to be tenable.

Puttalam, Ceylon; Calcutta; Khasis; Kuching, Borneo; twelve specimens.

Opogona stathmota, n. sp.

♂ ♀. 11-16 mm. Head dark fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally with a streak of dark fuscous suffusion. Antennae ochreous-whitish, basal joint dark fuscous. Thorax dark fuscous, posterior third yellow. Abdomen fuscous. Hairs of posterior tibiae pale

grey. Forewings elongate-lanceolate, apex acute, somewhat produced; yellow; a small triangular dark fuscous spot on base of costa, extending less than $\frac{1}{8}$ of wing; posterior half fuscous with slight purple gloss, its anterior edge rather outwardly oblique from costa, marked with a few black scales, with two or three slight irregular indentations: cilia fuscous. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon (Pole, Alston, de Mowbray); N. Coorg, 3,500 feet (Newcome); from March to May, and August to October, eight specimens. In *semisulphurea* the division of colour is nearly vertical, and the basal mark of costa forms a streak extending about $\frac{1}{5}$ of wing; in *isoclinea* the division is much more oblique, and the hairs of posterior tibiæ are ochreous-whitish.

Opogona xanthocrita, n. sp.

♀. 14-15 mm. Head dark purple-fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally with streak of dark fuscous suffusion. Antennæ ochreous-whitish, basal joint dark fuscous. Thorax yellow, anterior third dark purple-fuscous. Abdomen greyish. Hairs of posterior tibiæ pale whitish-ochreous tinged with grey. Forewings elongate-lanceolate, apex somewhat produced, acute; clear yellow; a wedge-shaped dark purple-fuscous mark on base of costa, extending hardly $\frac{1}{8}$ of wing; somewhat more than posterior half rather dark fuscous, with slight purplish gloss, anterior edge vertical, slightly irregular, marked with a few blackish scales: cilia fuscous. Hindwings grey; cilia pale greyish.

Nilgiris, 3,500 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); from August to November, five specimens. Intermediate between *semisulphurea* and *stathmota* in wing-markings, but differs from both in having the thorax mainly yellow.

Opogona pandora, n. sp.

♂ ♀. 13-14 mm. Head rather dark purplish-fuscous, face ochreous-whitish. Palpi ochreous-whitish, externally suffused with dark fuscous. Antennæ ochreous-whitish, basal joint rather dark fuscous above. Thorax dark purplish-fuscous, posterior third pale yellow. Abdomen grey. Forewings elongate-lanceolate, apex produced, acute; rather dark purplish-fuscous; a light yellow oblong blotch extending along dorsum from base to near middle of wing, and reaching $\frac{2}{3}$ or more across wing, posterior edge rather irregular: cilia fuscous. Hindwings rather dark grey; cilia grey.

Khasis, in October; two specimens.

Opogona sphaerotoma, n. sp.

♀. 10 mm. Head and thorax dark purplish-fuscous, fillet brassy-metallic, face ochreous-whitish. Palpi ochreous-whitish, terminal joint externally infuscated towards base. Antennæ ochreous-whitish, basal joint infuscated. Abdomen grey. Forewings elongate-lanceolate, apex somewhat produced, acute; dark purplish-fuscous; a bright yellow semi-circular

blotch extending on dorsum from $\frac{1}{4}$ of wing to beyond middle, and reaching more than half across wing: cilia bronzy-fuscous. Hindwings dark grey; cilia grey.

N. Coorg, 3,500 feet, in September (Newcome); one specimen.

Opogona cerodelta, n. sp.

♂ ♀. 11-15 mm. Head and thorax dark purplish-fuscous, face pale whitish-ochreous. Palpi ochreous-whitish, externally suffused with dark fuscous. Antennæ fuscous. Abdomen dark bronzy-fuscous. Forewings elongate-lanceolate, apex produced, acute; dark purplish-fuscous; a moderate sharply-defined triangular ochreous-whitish spot on dorsum somewhat before middle of wing, reaching $\frac{1}{3}$ across wing: cilia rather dark fuscous. Hindwings dark fuscous, in ♂ coppery-tinged; cilia rather dark fuscous.

Sikkim, 4,500 feet (Dudgeon); Khasis; in May, July, and October, five specimens.

Opogona plasturga, n. sp.

♂ ♀. 10-12 mm. Head and thorax dark purplish-fuscous, face ochreous-whitish, fillet brassy-metallic. Palpi ochreous-whitish, externally with a suffused fuscous streak. Antennæ rather dark fuscous. Abdomen dark fuscous. Forewings elongate-lanceolate, acute; dark purplish-fuscous; a transverse or sub-triangular whitish-ochreous spot on dorsum somewhat before middle of wing, anteriorly suffused, posteriorly well-defined, reaching more than half across wing: cilia rather dark fuscous. Hindwings dark bronzy-fuscous; cilia rather dark fuscous.

Nilgiris, 3,500 feet, in August (Andrewes); two specimens.

Opogona elaitis, n. sp.

♂. 10-11 mm. Head dark purplish-fuscous, face whitish, fillet silvery-metallic. Palpi whitish, externally with a dark fuscous streak. Antennæ fuscous-whitish, basal joint dark fuscous towards apex. Thorax rather light ochreous-grey. Abdomen grey. Forewings elongate-lanceolate, apex produced, acute; yellowish-grey, with a faint lilac gloss: cilia concolorous. Hindwings grey; cilia light grey.

N. Coorg, 3,500 feet (Newcome); from November to February, three specimens.

Opogona protographa, n. sp.

♂ ♀. 11-14 mm. Head, antennæ and thorax whitish-bronzy-ochreous. Palpi ochreous-whitish, externally with a dark fuscous streak. Abdomen greyish. Forewings elongate-lanceolate, apex slenderly long-produced, acute; pale bronzy-ochreous; costal edge suffused with dark fuscous towards base; a blackish discal dot at $\frac{2}{3}$, and one on dorsum slightly beyond this, sometimes also a third beneath costa in a line with these; posterior area beyond these sometimes tinged with fuscous, or more or less suffused with fuscous towards termen and apex: cilia pale bronzy-

yellowish, base sometimes tinged with fuscous. Hindwings grey; cilia pale greyish-yellowish.

Khasis, in September and October; fourteen specimens.

Amathyntis, Meyr.

This genus does not appear to have any close relationship with *Opogona* as originally stated, but is essentially a smooth-headed *Tinea*.

Amathyntis catharopa, n. sp.

♂. 12-14 mm. Head and thorax bronzy-yellowish, face silvery-white. Palpi whitish, second joint with a slight lateral line of blackish scales. Antennæ light greyish-ochreous. Abdomen whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex acute, termen extremely obliquely rounded; bronzy-yellowish: cilia light yellow. Hindwings more acutely pointed than in the other species; grey; cilia yellow-whitish.

Maskeliya, Ceylon (Pole); in October and January, two specimens.

Amathyntis oporina, n. sp.

♂ ♀. 12-17 mm. Head and thorax bronzy-yellowish, forehead and face shining whitish. Palpi dark grey, terminal joint white. Antennæ grey, basal joint white. Abdomen light greyish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; shining ochreous-yellow; cilia concolorous. Hindwings grey; cilia whitish-ochreous.

Khasis, from June to October; six specimens.

Amathyntis athyra, n. sp.

♂. 15 mm. Head and thorax bronzy-whitish-ochreous. Palpi dark fuscous, terminal joint whitish. Antennæ whitish-ochreous tinged with grey. Abdomen ochreous-grey-whitish. Forewings elongate, rather narrow, costa moderately arched, apex pointed, termen extremely obliquely rounded; light bronzy-ochreous-yellowish; costal edge suffused with dark fuscous from base to $\frac{2}{3}$; a few scattered dark fuscous scales towards apex: cilia light yellow, towards base with a few dark fuscous specks. Hindwings grey; cilia whitish-ochreous.

Maskeliya, Ceylon, in February (Pole); one specimen.

Amathyntis nucleolata, n. sp.

♂. 12-14 mm. Head, antennæ, thorax, and abdomen glossy whitish-ochreous. Palpi dark fuscous, terminal joint ochreous-whitish. Forewings elongate, rather narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; glossy whitish-ochreous, posteriorly with some scattered dark fuscous scales; costal edge dark fuscous towards base; a rather large cloudy dark fuscous dot in disc at $\frac{2}{3}$: cilia whitish-ochreous, somewhat sprinkled with dark fuscous specks. Hindwings whitish-grey; cilia pale whitish-ochreous.

Maskeliya, Ceylon (Pole); in May, November, and January, three specimens.

Epactris, Meyr.

It should have been mentioned in the characters of this genus that the stout antennæ are distinctly flattened.

Epactris thyreota n. sp.

♂. 8-9 mm. Head and palpi blackish. Antennæ ochreous-whitish. Thorax blackish-fuscous, patagia whitish-ochreous except shoulders. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; whitish-ochreous, markings blackish-fuscous; a large triangular patch extending along costa from base to $\frac{4}{5}$, broadest posteriorly, where it reaches $\frac{2}{3}$ across wing, but including a roundish spot of ground-colour in disc beyond middle, of which the dark lower edge is suffused or sometimes almost obsolete; apex of this patch connected with an irregular streak along termen; a slender streak along dorsum from base to near middle: cilia whitish-ochreous, towards base with undefined bars of dark fuscous suffusion. Hindwings grey; cilia pale grey.

Madulsima and Bandarawela, Ceylon (Pole, Vaughan, Fletcher); in April and May, four specimens. Nearly allied to *melanchæta* (of which I have now a good series), but much smaller and readily distinguished by the dark colour forming a broad unbroken costal band, whereas in *melanchæta* it is interrupted and spotted.

Monopis viatica, n. sp.

♂. 12 mm. Head whitish-ochreous. Palpi dark fuscous, apex whitish. Antennæ dark fuscous. Thorax pale reddish-ochreous, patagia blackish-fuscous. Abdomen fuscous, beneath whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; 2 out of 4, 6 to apex, 7 and 8 stalked; dark lilac-fuscous irregularly mixed with blackish; a roundish semi-hyaline whitish spot in disc before middle; a rather broad ferruginous-ochreous streak from base along dorsum and termen to apex: cilia pale ferruginous-ochreous, on costa dark fuscous. Hindwings with 6 and 7 stalked, 6 to apex; grey; cilia light grey.

Khasis, in May; one specimen.

Monopis florilega, n. sp.

♂. 11-12 mm. Head yellow. Palpi and antennæ dark fuscous. Thorax yellow, patagia dark fuscous. Abdomen grey. Forewings elongate, costa moderately arched, apex obtuse, termen obliquely rounded; 9 and 10 short-stalked; dark purple-fuscous irregularly mixed with blackish; a bright yellow streak along dorsum from base to tornus, upper edge rather prominent at $\frac{1}{3}$, and forming a triangular projection upwards before tornus, opposite which is a large irregular yellow costal spot reaching half across wing, marked with two or three small blackish strigulae on costa; an obscure whitish semi-hyaline spot in middle of disc; several minute whitish dots on costa posteriorly: cilia bright yellow, on costa dark fuscous, on

lower half of termen with basal third blackish. Hindwings with veins all separate; brassy-grey; cilia grey-whitish.

Matale and Madulsima, Ceylon (Pole, Fletcher); in May and August, three specimens.

Crypsithyris spectatrix, n. sp.

♂ ♀. 11-13 mm. Head light ochreous. Palpi dark fuscous, apex whitish. Antennæ dark fuscous. Thorax rather dark bronzy-fuscous. Abdomen light fuscous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; 7 and 8 stalked; dark bronzy-fuscous, somewhat paler-sprinkled in disc; a distinct whitish semi-hyaline oval longitudinal spot in disc before middle, formed of two adjacent circular impressions: cilia bronzy-fuscous, paler towards tips. Hindwings light bronzy-grey; cilia bronzy-whitish.

N. Coorg, 3,500 feet (Newcome); Nilgiris, 3,500 feet (Andrewes); in May and June, three specimens.

Crypsithyris soporata, n. sp.

♂ ♀. 11-13 mm. Head light brownish. Palpi dark fuscous, apex ochreous-whitish. Antennæ rather dark fuscous. Thorax brownish mixed with dark fuscous. Abdomen pale greyish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen extremely obliquely rounded; 7 and 8 stalked; pale ochreous-brownish, coarsely irrorated with dark fuscous; a small obscure semi-hyaline ochreous-whitish spot in middle of disc, sometimes followed by a cloudy spot of darker suffusion; slight indications of a lighter and more ochreous streak along dorsum, tending to be edged above with a dash of dark fuscous suffusion before discal semi-hyaline spot: cilia light brownish-ochreous sprinkled with dark fuscous. Hindwings rather light grey; cilia pale greyish-ochreous.

Maskeliya and Madulsima, Ceylon (Pole, deMowbray, Fletcher); in January, February and May, twelve specimens.

An obscure insect, most like *fissella*, but longer-winged, with hyaline spot much less developed and more inconspicuous, and without the dark fuscous suffused spot immediately beneath it.

Tinea schoenoploca, n. sp.

♂. 9 mm. Head white. Palpi white, with a black line above. Antennæ grey. Thorax ochreous-whitish, anterior margin suffused with blackish. Abdomen pale grey. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen faintly sinuate, extremely oblique; yellowish-white; markings blackish; a very oblique wedge-shaped patch extending over basal fourth of costa, its apex reaching in disc to near middle; about fifteen variable oblique lines from costa, reaching half across wing, mostly approximated in three groups before middle and at $\frac{2}{3}$ and $\frac{5}{6}$ respectively, their apices received by an irregular discal streak running to apex; an irregular oblique triangular patch from dorsum,

extending over its basal third, and another beyond middle, not reaching half across wing; a slender streak along termen: cilia whitish mixed with blackish (imperfect). Hindwings grey; cilia light grey.

N. Coorg, 3,500 feet, in September (Newcome); one specimen.

Tinea isoplaca, n. sp.

♂. 8 mm. Head whitish, crown suffused with blackish on sides. Palpi white. Antennæ ochreous-whitish. Thorax dark fuscous. Abdomen grey, anal tuft grey-whitish. Forewings elongate, costa moderately arched, apex round-pointed, termen faintly sinuate, extremely oblique; dark purplish-fuscous; a broad pale yellow transverse fascia about $\frac{1}{4}$; large opposite subcostal and dorsal pale yellow spots beyond middle; seven oblique wedge-shaped whitish strigulæ from posterior half of costa, first running into subcostal spot: cilia dark fuscous, beneath tornus yellow-whitish, at apex and on costa yellow-whitish, with a projecting apical dark fuscous bar, and barred on costa with dark fuscous. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in May (Pole); one specimen.

Tinea hierographia, n. sp.

♂ ♀. 11-13 mm. Head dark fuscous, forehead and back of crown pale yellowish. Palpi dark fuscous, internally white. Antennæ ochreous-grey-whitish, basal joint dark fuscous, ciliations in ♂ 1. Thorax blackish, with broad posterior transverse yellow band. Abdomen dark fuscous, anal tuft in ♂ mixed with white. Forewings elongate, costa moderately arched, apex tolerably pointed, termen extremely obliquely rounded; purple-blackish-fuscous; a small yellow dorsal spot near base; a rather irregular transverse yellow fascia at $\frac{1}{4}$, connected in middle with base by an irregular sometimes interrupted yellow line; seven oblique yellow strigulæ from costa between $\frac{1}{3}$ and apex, last two enlarged into wedge-shaped spots; a yellow dot on termen beneath apex: cilia dark fuscous, with yellow spots on markings. Hindwings and cilia in ♂ rather dark grey, in ♀ dark fuscous.

Maskeliya, Ceylon (Pole); in September and October, four specimens.

Tinea imbricata, n. sp.

♂. 10-11 mm. Head fuscous, suffused with dark fuscous behind antennæ, face whitish. Palpi whitish, second joint marked with dark fuscous towards apex. Antennæ ochreous-grey-whitish, basal joint dark fuscous. Thorax pale yellow, anterior margin suffused with blackish (imperfect). Abdomen dark grey. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded; dark fuscous, becoming deep bronzy towards costa; an irregular-edged light yellow patch occupying basal $\frac{2}{3}$, enclosing eight small blackish spots, viz., three basal, one on costa near base, and a curved transverse series of four at $\frac{1}{4}$; seven oblique wedge-shaped white costal streaks between this and apex; a small white

triangular spot on dorsum before tornus: cilia dark fuscous, at apex with a white patch divided into two triangular segments by a blackish hook, on costa white with dark fuscous bars. Hindwings dark grey; cilia grey.

Maskeliya and Patipola, Ceylon (de Mowbray, Alston, Pole); in September and January, three specimens.

Tinea trierodes, n. sp.

♂. 14 mm. Head whitish, crown suffusedly mixed with dark fuscous. Palpi white. Antennæ whitish, infuscated. Thorax yellow-whitish, anteriorly suffused with fuscous. Abdomen greyish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen slightly rounded, extremely oblique; dark purplish-fuscous, towards costa ochreous-bronzy; markings shining whitish suffused with light ochreous-yellowish; a patch occupying basal $\frac{2}{3}$ of wing, containing two or three small dark fuscous spots, and marked on costa with indistinct oblique streaks of ground colour; seven oblique wedge-shaped streaks from costa between this and apex; an irregular blotch on dorsum before tornus, reaching half across wing, cilia fuscous, base obscurely dotted with whitish on termen, on costa bronzy-ochreous barred with whitish. Hindwings grey, darker posteriorly; cilia grey tinged with whitish.

Palni Hills (Campbell); one specimen.

Tinea brachychlora, Meyr.

In the published description of this species the basal patch is stated (by an error of printer) to occupy $\frac{3}{4}$ of wing; it should be $\frac{2}{3}$. The species is very like *camarota*, but the ground-colour of forewings is dark fuscous, markings pale yellow, subcostal projection of basal patch much less prominent.

Maskeliya, Patipola, and Hakgala, Ceylon; five specimens.

Tinea scenatica, n. sp.

♀. 10 mm. Head fuscous, face white. Palpi white, second joint sprinkled with dark fuscous externally. Antennæ ochreous-whitish. Thorax yellow-whitish, anteriorly suffused with dark fuscous. Abdomen grey-whitish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; dark fuscous, becoming deep bronzy towards costa; a white antemedian fascia with an angular subcostal projection posteriorly, basal area as far as this fascia pale yellow; six oblique white costal strigulae between this and apex; a rather irregular white line along termen: cilia white, beneath tornus dark fuscous, at apex with two diverging dark fuscous bars, on costa barred with dark fuscous. Hindwings light grey; cilia whitish-grey.

Maskeliya, Ceylon, in January (Pole); one specimen. Nearest to *brachychlora*, but much smaller, and without the large ternal patch.

Tinea camarota, n. sp.

♂ ♀ 12-15 mm. Head and palpi dark brown. Antennæ whitish.

grey-ochreous. Thorax white, anterior margin dark brown, abdomen grey-whitish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; ochreous-bronze, mostly suffused with dark fuscous except towards costa; a shining white patch occupying basal of wing, with an acute-triangular subcostal projection extending to beyond middle, sometimes enclosing a very small dark fuscous spot on dorsum at $\frac{1}{4}$; six oblique white wedge-shaped strigulae from costa between this and apex; an irregular white streak along termen, dilated on tornus into a rounded-triangular blotch: cilia white, at apex with two diverging blackish bars. Hindwings grey-whitish; cilia white.

Maskeliya and Patipola, Ceylon (Pole, Alston, Green); in April, August and September, seven specimens.

Tinea strophiota, n. sp.

♀. 18 mm. Head pale ochreous-yellowish. Palpi and antennae whitish-ochreous, antennae gradually infuscated towards tips. Thorax pale ochreous-yellowish, anteriorly irrorated with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; ochreous-brown; costal edge dark fuscous towards base; a very broad inwardly oblique white antemedian fascia, edged with dark fuscous irroration, posterior edge rather irregular, running from middle of costa to middle of dorsum; a small triangular white spot before tornus; a white dot on costa just before apex: cilia ochreous-brown sprinkled with dark fuscous, above apex with a light ochreous-yellowish patch. Hindwings with 5 and 6 stalked; grey; cilia pale ochreous.

Nilgiris, 3,500 feet, in May (Andrewes); one specimen.

Tinea charmatica, n. sp.

♂. 18 mm. Head yellowish-white. Palpi white, second joint with a lateral streak of dark fuscous irroration. Antennae whitish-ochreous. Thorax white, dorsally yellowish-tinged, shoulders with a fuscous spot. Abdomen whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded; ochreous-yellow, sprinkled with fuscous; markings white, partially edged with a few dark fuscous scales; a broad anterior transverse fascia, inner edge near base, straight, outer edge running from middle of costa to middle of dorsum, with very acute angular projection beneath costa; four small oblique wedge-shaped spots on costa between this and apex; a large triangular spot on dorsum before tornus; a triangular blotch resting on apex and upper $\frac{2}{3}$ of termen: cilia pale yellowish. Hindwings bronzy-grey; cilia whitish-ochreous.

Palni Hills, 6,000 feet (Campbell); one specimen.

Tinea sindonia, n. sp.

♂ ♀. 20-24 mm. Head ochreous-whitish. Thorax white, anteriorly

ochreous-whitish, shoulders with a dark fuscous spot. Palpi ochreous-whitish, second joint externally dark fuscous except apex, terminal joint long, sometimes dark fuscous towards base. Antennæ ochreous-whitish, tinged with grey towards apex. Abdomen ochreous-grey-whitish. Forewings elongate, costa moderately arched, apex tolerably pointed, termen very obliquely rounded; pale whitish-ochreous, yellowish-tinged, in one specimen suffused with fuscous except towards base; markings white, sometimes yellowish-tinged, edged with scattered dark fuscous scales; two triangular blotches occupying most of dorsum, reaching nearly half across wing; undefined patches towards costa before middle, and in disc at $\frac{2}{3}$, sometimes almost obsolete; a semicircular spot on costa before apex, and two or three irregular spots on termen, more or less edged with dark fuscous suffusion: cilia pale whitish-ochreous sometimes mixed with fuscous, at apex with a dark fuscous bar. Hindwings with 5 and 6 stalked; pale brassy-whitish-yellowish; cilia yellow-whitish.

Palni Hills, 6,000 feet (Campbell); five specimens.

Tinea chelyodes, n. sp.

♀. 16 mm. Head and thorax pale ochreous, shoulders infuscated. Palpi whitish-ochreous. Antennæ whitish-ochreous, towards apex with several rings of dark fuscous suffusion. Abdomen whitish-ochreous. Forewings elongate, costa gently arched, apex pointed, termen extremely obliquely rounded; bronzy-yellow-ochreous; costa suffused with dark fuscous near base; two transverse white streaks towards base, confluent towards costa into a patch containing three costal dots of groundcolour, with a white dorsal dot between them; between this and apex are about eight indistinct transverse whitish streaks, posteriorly obsolete towards costa, and several dots on costa and termen towards apex; a blackish-fuscous elongate patch extending along dorsum from $\frac{3}{5}$ to beyond tornus, cut by one streak anteriorly and enclosing several whitish dorsal dots: cilia pale whitish-ochreous, obliquely barred with dark fuscous irroration, at apex with a direct projecting blackish bar, on costa whitish transversely barred with yellow-ochreous. Hindwings grey-whitish; cilia pale whitish-ochreous.

Khasis, in October; one specimen.

Tinea artificiosa, n. sp.

♂. 12 mm. Head and thorax white, shoulders marked with dark fuscous. Palpi and antennæ fuscous-whitish. Abdomen pale grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; shining bronzy-ochreous tinged with fuscous; markings shining white; a basal patch occupying rather more than $\frac{1}{3}$ of wing, outer edge angulated in disc, enclosing dark fuscous marks on base of costa and dorsum, and a striga of groundcolour mixed with dark fuscous from dorsum at $\frac{1}{5}$, reaching half across wing; a spot on dorsum close beyond this, and

two smaller adjacent spots on fold and dorsum respectively; seven oblique wedgeshaped costal marks between this and apex; a subtriangular spot on dorsum before tornus, edged with dark fuscous and surmounted by a curved streak; a longitudinal streak in disc above this, followed by an undefined longitudinal patch of dark fuscous irroration: cilia bronzy-whitish, at apex with two diverging dark fuscous bars, on costa barred with dark fuscous, on termen with a dark fuscous subbasal line. Hindwings light grey; cilia whitish.

Patipola, Ceylon, in September (Alston); one specimen.

Tinea melanochrysa, n. sp.

♂. 11-14 mm. Head, palpi, antennæ, and thorax blackish. Abdomen dark fuscous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; shining ochreous-yellow; markings brown more or less suffused with dark fuscous; a broad irregular streak along costa, dilated in middle where it reaches half across wing, on apical fourth often variably reduced in width and enclosing a white marginal striga which is sometimes once or twice interrupted; a rather broad streak from dorsum beyond middle along termen to apex, sometimes extending to base, somewhat whitish-sprinkled, above tornus rather triangularly prominent, in one specimen broadly confluent here with projection of costal streak: cilia yellow, on costa and round apex with a strong dark fuscous basal line, at apex with a dark fuscous bar. Hindwings and cilia dark grey.

Khasis, in May and June; eight specimens.

Tinea canicoma, n. sp.

♂ ♀. 14-17 mm. Head white, face, palpi, and antennæ blackish. Thorax light yellow or yellow-whitish, shoulders narrowly blackish. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen extremely obliquely rounded; light bronzy-ochreous-yellow, sometimes suffused with white on margins of dark markings; a broad dark fuscous costal streak from base to $\frac{3}{4}$, widest in middle of wing; beyond this a white striga along costa to apex, partially edged anteriorly with blackish; a dark fuscous streak from base along dorsum to origin of cilia, thence continued as a broader brown or deeper yellow streak edged with blackish to apex, on tornus somewhat sprinkled with dark fuscous and projecting upwards: cilia ochreous-yellow, round costa and apex with strong dark fuscous basal and less pronounced postmedian line. Hindwings and cilia rather dark grey.

Khasis, in June, September, and October; six specimens. Very like *melanochrysa*, but immediately distinguished by the different colour of head and thorax.

Tinea sartoria, n. sp.

♂. 13 mm. Head, palpi, antennæ, and thorax blackish, posterior

margin of thorax slenderly white. Abdomen dark grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen extremely obliquely rounded; pale ochreous-yellow; a broad dark fuscous streak along costa from base, finely white-edged beneath, broadest in middle of wing, terminated by a fine oblique white strigula about $\frac{2}{3}$, beyond this is a narrower blackish-fuscous costal streak to near apex, cut by a second fine white oblique strigula, and followed by two small white dots before apex, these markings margined beneath by a light ochreous-brown streak; a brown streak edged with black from near base along dorsum and termen to apex, on terminal edge marked with a slender white striga edged with blackish: cilia ochreous-yellowish, on costa with basal and postmedian dark fuscous lines, at apex with broad dark fuscous bar. Hindwings and cilia dark grey.

Khasis, in March; one specimen.

Tinea melliflua, n. sp.

♂. 13-16 mm. Head and thorax pale ochreous-yellow, face, shoulders, and palpi dark fuscous. Antennæ dark grey. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; light yellow; a suffused grey streak along costa from base to $\frac{3}{4}$, where it is replaced by an orange streak edged anteriorly on both margins with grey and marked with a white oblique strigula edged anteriorly with dark grey; this costal streak is sometimes tinged with orange suffusion beneath, and a small blackish-grey spot adjoins it in middle; a narrow dark grey streak along dorsum from $\frac{1}{4}$ to origin of cilia, thence continued as an irregular subterminal streak to a small apical spot of blackish irroration, with white adjacent dots above and beneath: cilia light yellow, on costa with fuscous subbasal line. Hindwings grey; cilia grey-whitish.

Maskeliya, Ceylon (Pole); in September and October, three specimens.

Tinea zalocoma, n. sp.

♂ ♀. 11-13 mm. Head ochreous-whitish. Palpi dark fuscous, tip whitish. Antennæ grey. Thorax ochreous-whitish, shoulders dark fuscous. Abdomen grey, anal tuft whitish. Forewings elongate, rather narrow, long-pointed, acute; light grey mixed with white and pale ochreous-yellowish; costa irregularly strigulated or irrorated with blackish; markings formed of blackish irroration mixed with pale ochreous-yellowish suffusion; roundish spots beneath costa at $\frac{1}{4}$ and before middle, and smaller dorsal spots opposite these; a larger subtriangular spot on costa at $\frac{3}{4}$, its apex nearly reaching a small tornal spot; an undefined apical spot: cilia whitish-yellowish mixed with whitish. Hindwings lanceolate, grey; cilia light grey.

Maskeliya, Ceylon (Pole); in February, four specimens.

Tinea spharagistis, n. sp.

♀. 14 mm. Head pale whitish-ochreous. Palpi blackish, terminal joint

ochreous-whitish except base. Antennæ over 1, dark fuscous. Thorax brown mixed with dark fuscous. Abdomen grey. Forewings narrow, long-pointed, acute; 7 and 8 stalked; grey mixed with whitish and sprinkled with dark fuscous, margins suffused with dark fuscous; four roundish spots of blackish-fuscous suffusion, *viz.*, one on fold at $\frac{1}{3}$, two in disc at $\frac{2}{5}$ and $\frac{2}{3}$, and one on dorsum between these two; an elongate blackish-fuscous patch along termen: cilia pale grey, towards base sprinkled with dark fuscous. Hindwings lanceolate, grey; cilia light grey.

Gooty (Campbell); one specimen.

Tinea plasmatica, n. sp.

♂ ♀. 24-27 mm. Head light greyish-ochreous. Palpi dark fuscous, terminal joint ochreous-whitish except towards base. Antennæ fuscous. Thorax light brownish, shoulders suffused with dark fuscous. Abdomen pale greyish-ochreous. Forewings elongate, rather narrow, in ♂ narrower, costa gently arched, apex pointed, termen extremely obliquely rounded; light greyish-ochreous, more or less mixed with brown, veins partially marked with dark fuscous lines; costa, dorsum, and termen marked with numerous small dark fuscous spots, and there is a median longitudinal series of similar spots connecting dark veins; a very oblique patch of dark fuscous suffusion from costa near base to fold; stigmata forming rather large suffused roundish dark fuscous spots, plical somewhat beyond first discal and confluent with it: cilia pale greyish-ochreous, with subbasal and postmedian shades of dark fuscous irroration. Hindwings grey; cilia pale greyish-ochreous.

Khasis, in December; two specimens.

Tinea orphnodes, n. sp.

♂ ♀. 14-19 mm. Head ochreous-yellow. Palpi dark fuscous, apex ochreous-whitish. Antennæ pale whitish-ochreous. Thorax dark purple-fuscous. Abdomen rather dark grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; glossy pale ochreous, sometimes speckled with grey; costa variably suffused with dark grey anteriorly, sometimes only towards base, sometimes more broadly from base to $\frac{3}{4}$; usually a cloudy dark fuscous dot in disc at $\frac{3}{4}$, and apical patch of dark fuscous suffusion, but these are sometimes almost obsolete: cilia pale ochreous, sprinkled with fuscous, round apex more or less suffused with dark fuscous irroration. Hindwings rather dark bronzy-purplish-grey; cilia pale grey, with darker grey subbasal shade.

Khasis, from March to May and in August and November; seven specimens.

Tinea iritis, n. sp.

♂. 18-24 mm. Head yellow-ochreous. Palpi dark fuscous, sometimes yellowish towards apex. Antennæ nearly 1, whitish-ochreous. Thorax dark grey-purplish. Abdomen ochreous. Forewings elongate, rather narrow

costa moderately arched, apex obtuse, termen very obliquely rounded; dark grey-purplish, sometimes with strong indigo-green gloss: cilia grey-purplish, sometimes mixed with pale ochreous, towards base more greenish-purple. Hindwings light ochreous-fuscous; cilia pale ochreous, with fuscous subbasal shade.

Quetta (Nurse); Ajmere; from June to September, six specimens.

Tinea sacerdos, Wals.

♂ ♀. 22-36 mm. Head clear light yellow. Antennæ whitish. Thorax purple. Forewings purple. Hindwings rather dark purple-fuscous.

Konkan (Young); Karwar (Maxwell); Simla. I give short characters here to show its distinctness, as this group of nearly-allied unicolorous species requires care.

Tinea glabrella, Walk.

♂ ♀. 16-25 mm. Head clear light yellow. Antennæ white lined with blackish. Thorax lilac-brownish-ochreous. Forewings brownish-ochreous finely irrorated with fuscous, with strong lilac-purplish gloss. Hindwings rather dark purplish-grey.

Madulsima, Maskeliya, Haputale, and Matale, Ceylon (Vaughan, Pole, Alston, deMowbray); N. Coorg, 3,500 feet (Newcome).

Tinea opsigona, n. sp.

♂ ♀. 22-34 mm. Head deep yellow. Palpi short, dark fuscous, tip yellowish. Antennæ ochreous-whitish. Thorax lilac-yellow-ochreous. Abdomen deep ochreous-yellowish. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; yellow-ochreous, sometimes tinged with grey, with lilac-purplish gloss; costal edge purplish-fuscous towards base: cilia yellow-ochreous. Hindwings rather dark bronzy-purple-grey; cilia light greyish-ochreous or grey, with darker subbasal shade.

Peradeniya, Haldamulla, Gampola, Diyatalawa, Balangoda, Matale, and Pundaluoya, Ceylon (Green, Alston, Pole, Fletcher); Nilgiris, 3,500 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); from February to October, sixteen specimens. This large species has been often regarded as identical with the equally large South African *vastella*, but is distinct.

Tinea cholæa, n. sp.

♂. 20-21 mm. Head pale greyish-ochreous. Palpi dark fuscous towards tips pale greyish-ochreous. Antennæ grey. Thorax dark ashy-fuscous. Abdomen grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen slightly rounded, rather strongly oblique; greyish-bronzy-ochreous, with slight prismatic reflections, sometimes sprinkled with fuscous; costa more or less suffused with dark ashy-fuscous on anterior half; a cloudy dot of fuscous suffusion in disc beyond $\frac{3}{4}$: cilia light bronzy-ochreous, sometimes sprinkled with grey. Hindwings bronzy-grey; cilia pale greyish-ochreous.

Diyatalawa, Ceylon, in September (Fletcher); two specimens. The colour of antennæ affords a good leading point of distinction in this group.

Tinea platyntis, Meyr.

♂ ♀. 14-20 mm. Head deep yellow. Antennæ ochreous-whitish. Thorax yellow-ochreous, more or less suffused anteriorly with dark purple-fuscous. Forewings yellow-ochreous, with faint purple gloss; costal edge more or less dark purple-fuscous towards base. Hindwings rather dark purple-grey.

Trincomali and Eppawela, Ceylon (Green, Fletcher); Cuddapah, 4,000 feet (Campbell); Nilgiris, 3,500-6,000 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); Koni and Mone, Burma (Manders); in May and June, and from September to December.

Trophinæa testata, n. sp.

♂ ♀. 10-12 mm. Head pale whitish-ochreous. Palpi whitish, second joint externally marked with dark fuscous. Antennæ fuscous, ciliations in ♂ $1\frac{1}{2}$, basal tuft ochreous-whitish. Thorax ochreous-whitish, somewhat sprinkled with dark fuscous. Abdomen grey-whitish, in ♀ with large ochreous-whitish anal tuft. Forewings elongate, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; 4 absent; whitish-ochreous sprinkled with white points, and more or less strewn with dark fuscous strigulæ; markings dark fuscous; a narrow rather oblique fascia near base, interrupted in middle; an irregular somewhat oblique fascia before middle; a spot on costa beyond middle; an irregular rather inwards-oblique fascia about $\frac{3}{4}$, narrowed on costa; a small spot on costa towards apex, and a series of five along termen: cilia ochreous-whitish, sprinkled with dark fuscous, tending to form undefined bars. Hindwings with 4 absent; pale grey; cilia ochreous-whitish.

Peradeniya and Madulsima, Ceylon (Green, Vaughan); in March and April, seven specimens. Very like *arenatella*, but larger, and easily distinguished by absence of vein 4 in both wings.

Lepidoscia globigera, n. sp.

♂. 13-15 mm. Head fulvous-ochreous. Palpi with loosely projecting scales, ochreous, somewhat mixed with dark fuscous. Antennæ dark fuscous, ciliations 4, fasciculated. Thorax dark purplish-fuscous. Abdomen dark fuscous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen very obliquely rounded; 7 absent; deep fuscous-purplish, suffusedly strigulated with dark fuscous; costa irregularly strigulated with whitish-ochreous; dorsum with a patch of whitish-ochreous strigulation extending from $\frac{1}{3}$ to $\frac{4}{5}$, widest before middle, where it reaches $\frac{1}{3}$ across wing; several small whitish-ochreous dots on termen: cilia fuscous-purplish mixed with dark fuscous, on termen with two or three undefined bars of ochreous-whitish suffusion. Hindwings and cilia rather dark purplish-bronzy-fuscous.

♀. Length 4 mm.; head small, antennæ and legs short and weak, slender, abdomen with whitish anal tuft; wings reduced to minute rudiments.

Haputale, Ceylon (Green); 9 ♂, 2 ♀, bred in February. Larva in a sub-globose egg-shaped case of silk covered with grains of refuse, feeding on lichens; length of case 8-10 mm., width 5-7 mm.

Mallobathra cellulata, n. sp.

♂. 12-13 mm. Head and palpi whitish-ochreous-yellowish. Antennæ dark fuscous, ciliations 4. Thorax and abdomen dark fuscous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 6 present; dark purple-fuscous, costa sharply spotted with pale ochreous-yellowish, rest of wing wholly strewn with obscure suffused whitish-ochreous dots: cilia dark purple-fuscous, on costa barred with pale yellowish on spots, on termen with a basal series of pale yellowish spots, round apex with tips ochreous-whitish. Hindwings with 6 present; rather dark bronzy-fuscous; cilia fuscous, paler towards tornus.

Maskeliya, Ceylon, in January (Pole); seven specimens.

Elegistis, n. g.

Head rough; ocelli present; tongue absent. Antennæ $\frac{1}{2}$, in ♂ biciliated with long fascicles, basal joint moderate, without pecten. Labial palpi moderate, porrected, clothed with dense loose scales, obtuse. Maxillary palpi obsolete. Posterior tibiæ clothed with long hairs above. Forewings with 2 from towards angle, 7 to apex, 8 and 9 short-stalked, 11 from before middle. Hindwings under 1, elongate-ovate, cilia $\frac{3}{4}$; 5 absent, other veins separate, nearly parallel.

Elegistis cunicularis, n. sp.

♂ ♀. 10-13 mm. Head and thorax grey sprinkled with grey-whitish and blackish. Palpi blackish sprinkled with grey-whitish. Antennal ciliations of ♂ 5. Abdomen dark fuscous. Forewings elongate, moderate, costa gently arched, apex obtuse, termen obliquely rounded; purplish-fuscous suffusedly irrorated with blackish; a moderate rather curved fuscous-whitish fascia at $\frac{1}{3}$, another at $\frac{2}{3}$ interrupted in disc, and a band of undefined cloudy spots towards termen, but these are always more or less obscured by dark fuscous irroration, and sometimes wholly obsolete and merged in ground colour: cilia dark purple-fuscous sprinkled with whitish points. Hindwings and cilia dark fuscous, purplish-tinged.

Maskeliya and Peradeniya, Ceylon (Green, Pole); in October, five specimens. Bred from larvæ tunnelling dead wood, making long external tubes of silk and refuse (Green).

Thisizima bubalopa, n. sp.

♂ 14-16 mm., ♀ 20 mm. Head ochreous. Palpi pale ochreous, second joint dark fuscous except towards apex. Antennæ pale ochreous. Thorax dark purplish-fuscous. Abdomen light fuscous. Forewings elongate, costa

moderately arched, apex obtuse, termen very obliquely rounded; dark purplish-fuscous, with indigo-blue reflections: cilia concolorous. Hindwings bronzy-fuscous; cilia light bronzy-fuscous, paler or whitish-tinged towards tips.

Peradeniya, Ceylon (Green); Nilgiris, 3,500 feet (Andrewes); in May, July, and December, eight specimens.

Myrmecozela, Zell.

Head loosely rough-haired; ocelli present; tongue absent. Antennæ $\frac{3}{2}$, in ♂ stout, compressed, simple, basal joint short, without pecten. Labial palpi moderate, ascending, second joint clothed with dense rough scales, with long projecting lateral bristles, terminal joint short, loosely scaled, somewhat obtuse. Maxillary palpi obsolete. Posterior tibiae loosely scaled above. Forewings with 2 from towards angle, 7 to apex, 8 and 9 rather approximated, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 2-7 tolerably parallel.

This genus apparently indicates the passage from *Melasina* to *Thisizima*.

Myrmecozela leontina, n. sp.

♂ 17-18 mm., ♀ 24 mm. Head, palpi, thorax, and abdomen deep ochreous. Antennæ pale ochreous. Forewings elongate, somewhat dilated posteriorly, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; brownish-ochreous; more or less faintly indicated cloudy fuscous spots round posterior part of costa and termen: cilia brownish-ochreous; outer half suffused with fuscous. Hindwings rather dark purplish-fuscous; cilia pale ochreous tinged with fuscous, with fuscous subbasal shade.

Kulu, Punjab; four specimens.

Myrmecozela glebifera, n. sp.

♂ ♀. 15-18 mm. Head and thorax ochreous-brown, face ochreous. Palpi ochreous, sometimes mixed with dark fuscous. Antennæ and abdomen dark fuscous. Forewings elongate, costa gently arched, apex rounded-obtuse, termen obliquely rounded; rather dark purple-fuscous mostly suffused with ochreous-brown, the dark ground colour appearing to form obscure strigulae; posterior part of costa and termen more distinctly spotted with dark fuscous: cilia dark purple-fuscous, base pale ochreous. Hindwings and cilia dark fuscous, faintly purplish-tinged.

Khasis, from March to May; fourteen specimens.

Myrmecozela metrophora, n. sp.

♂. 12-14 mm. Head greyish-ochreous, face whitish-ochreous. Palpi whitish-ochreous mixed with dark fuscous. Antennæ and abdomen dark fuscous. Thorax fuscous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen rounded, rather strongly oblique; fuscous or ochreous-fuscous, more or less suffusedly irrorated with dark fuscous; costa and termen regularly marked throughout with suffused dark fuscous

spots; a suffused dark fuscous spot in disc at $\frac{2}{3}$: cilia light brownish-ochreous or fuscous, obscurely barred with dark fuscous irroration. Hindwings and cilia rather dark fuscous.

Ajmere, in July; three specimens.

Sapheneutis galerita, n. sp.

♂. 15 mm. Head and palpi dark fuscous. Antennæ whitish-ochreous, basal joint dark fuscous, ciliations $2\frac{1}{2}$. Thorax whitish-ochreous, anterior half dark fuscous. Abdomen pale whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex rounded-obtuse, termen obliquely rounded; 7 and 8 separate; whitish-yellowish; costal edge dark fuscous towards base; a round blackish dot in disc at $\frac{2}{3}$: cilia whitish-yellowish. Hindwings and cilia yellow-whitish.

Sikkim, 4,500 feet, in August (Dudgeon); one specimen. Allied to *S. metacentra*.

Machæropteris, Wals.

Head rough-scaled; ocelli present; tongue absent. Antennæ under $\frac{1}{2}$, in ♂ very slender, simple, basal joint short. Labial palpi moderate, second joint clothed with long dense projecting tuft of rough scales beneath and expanded bristles or long rough hair scales laterally and at apex above, terminal joint short, slender, obtuse, ascending, more or less concealed in scales of second joint. Maxillary palpi obsolete. Thorax with posterior crest. Anterior tibiæ and tarsi short, posterior tibiæ rough-haired above, in ♂ with these hairs usually more or less elongate and expansible. Forewings with numerous tufts and ridges of raised scales on surface; 2 from angle, sometimes stalked with 3, 7 to costa or apex, separate or stalked or coincident with 8, 9 and 10 sometimes approximated or short-stalked, 11 from before middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 2-7 separate, 5 and 6 more or less approximated at base.

Type *phenax*, Meyr. (*receptella*, Wals., nec Walk.). This curious genus at first seems to present difficulties, as the obscurely-coloured species have usually no defined markings, and are apparently seldom obtained in good condition; but on examination of the form of wing and neuriation they are found to be really easily determinable. The antennæ are unusually short and slight, and I know no other genus of *Lepidoptera* in which they are so slender and weak in the ♂. *Dasyse*, Durr., and *Trachycentra*, Meyr., are allied genera. I give a tabulation of the species based on trustworthy points of difference:—

1. Vein 7 of forewings absent	..	..	..	<i>taciturna</i> .
Vein 7 of forewings present	..	..	..	2.
2. Vein 7 of forewings to apex	..	..	..	3.
Vein 7 of forewings to costa	..	..	..	6.
3. Apex of forewings pointed	..	..	..	4.
Apex of forewings rounded-obtuse	..	..	..	5.

- | | | | |
|----|--|----|---------------------|
| 4. | Apex of forewings much produced | .. | <i>phenax.</i> |
| | Apex of forewings not produced | .. | <i>limatula.</i> |
| 5. | Forewings moderate, with dark median fascia .. | .. | <i>frenigera.</i> |
| | Forewings rather narrow, without fascia .. | .. | <i>vernacula.</i> |
| 6. | Head and palpi whitish-ochreous | .. | <i>melicera.</i> |
| | Head and palpi brownish or dark fuscous .. | .. | 7. |
| 7. | Forewings with 7 and 8 stalked | .. | <i>receptella.</i> |
| | Forewings with 7 and 8 separate | .. | 8. |
| 8. | Apex of forewings produced, head dark fuscous .. | .. | <i>horrifera.</i> |
| | Apex of forewings not produced, head brownish .. | .. | 9. |
| 9. | Apex pointed, tibial hairs whitish-ochreous .. | .. | <i>halistrepta.</i> |
| | Apex round-pointed, tibial hairs grey .. | .. | <i>ceramina.</i> |

Machæropteris taciturna, n. sp.

♂ ♀. 24-27 mm. Head, palpi, and thorax fuscous, more or less mixed or suffused with dark fuscous. Abdomen dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, termen hardly sinuate, oblique; 7 absent, 9 and 10 approximated or stalked; fuscous, suffusedly irrorated with dark fuscous, without defined markings: cilia fuscous sprinkled with pale ochreous, more or less obscurely barred with dark fuscous suffusion. Hindwings rather dark purplish-bronzy-fuscous; cilia fuscous.

Madulsima and Hakgala, Ceylon (Vaughan, Green); from March to May, five specimens.

Machæropteris receptella, Walk.

(*Tinea receptella*, Walk, Cat. XXVIII, 479.)

♂ ♀. 16-20 mm. Posterior tibiæ in ♂ with extremely long expansible grey hairs. Forewings with apex pointed, produced, termen sinuate, oblique; 7 and 8 stalked, 7 to costa, 9 and 10 approximated or short-stalked; fuscous, irregularly irrorated with dark fuscous. Hindwings dark grey.

Peradeniya, Colombo, and Trincomali, Ceylon (Green, Mackwood, Fletcher); in April, July, October and December, seven specimens.

Machæropteris halistrepta, n. sp.

♂ ♀. 23-27 mm. Head and thorax ochreous-brownish, usually more or less variably irrorated with dark fuscous. Palpi brownish, hairs suffused with dark purple-fuscous except towards base. Abdomen rather dark grey. Posterior tibiæ in ♂ with long whitish-ochreous hairs. Forewings elongate, costa moderately arched, apex pointed, termen somewhat sinuate, oblique; 7 separate, to costa, 9 and 10 approximated; lilac-brown, closely irrorated with brownish-ochreous, usually with some irregular undefined and variable groups of dark fuscous scales: cilia lilac-brownish irrorated with pale ochreous, more or less barred with dark fuscous, especially at apex. Hindwings rather dark purplish-fuscous; cilia fuscous sprinkled with ochreous-whitish.

Puttalam, Ceylon (Pole); Gooty (Campbell); Konkan (Young); in December, six specimens. Larval case elongate, nearly flat, parallel-sided (12 mm. \times 4 mm.), both ends rounded; composed of silk and grains of refuse, but entirely coated with silk outside; sent without note of habits (Campbell), possibly a wood-feeder, or on dead leaves, but the case is not suitable for a lichen-feeder.

Machæropteris ceramina, n. sp.

♂ ♀. 30-39 mm. Head brownish. Palpi brownish irrorated with dark fuscous. Thorax dark brown or dark fuscous. Abdomen fuscous. Posterior tibiæ in ♂ with extremely long expansible fine greyish hairs. Forewings elongate, costa moderately arched, apex round-pointed, termen sinuate, oblique; 7 separate, to costa, 9 and 10 remote; dark brown, suffusedly irrorated with dark fuscous or sometimes partially with blackish, costa sometimes obscurely darker-spotted: cilia brown, mixed with dark brown and sprinkled with pale ochreous. Hindwings rather dark fuscous; cilia fuscous.

Maskeliya, Peradeniya, and Bogawantalawa, Ceylon (Pole, de Mowbray, Green); in October, November, and May, seven specimens.

Machæropteris phenax, n. sp.

(*Machæropteris receptella*, Wals. (nec Walk.), Moore Lep. Ceyl. III, 502, pl. ccviii, 14.)

♂ ♀. 28-36 mm. Head brownish. Palpi dark brown, scales with ochreous-whitish tips. Thorax dark brown. Abdomen dark fuscous. Forewings elongate, costa moderately arched, apex much produced, acute, termen sinuate, oblique; 2 and 3 approximated or sometimes stalked, 7 separate, to apex, 9 and 10 remote; brown or purplish-fuscous, irrorated with dark fuscous, with some bluish-lead scales, without defined markings: cilia lilac-brownish sprinkled with dark fuscous, towards base yellow-ochreous, at apex with a projection of dark fuscous scales. Hindwings dark fuscous; cilia fuscous sprinkled with dark fuscous, base pale ochreous.

Peradeniya, Ceylon (Green); in August and December, four specimens. I am indebted to Mr. J. Hartley Durrant for the information that this was the species on which the genus *Machæropteris* was founded, and not the true *receptella*, Walk.

Machæropteris horrifera, n. sp.

♂. 22 mm. Head, palpi, and thorax dark fuscous. Abdomen fuscous. Posterior tibiæ with very long fuscous hairs. Forewings elongate, costa moderately arched, apex pointed, produced, termen sinuate, oblique; 2 and 3 connate, 7 to costa, separate, 9 and 10 approximated at base; dark purplish-fuscous, raised scales with a bluish-lead gloss: cilia dark purplish-fuscous. Hindwings and cilia fuscous.

Sikkim, in August (Dudgeon); one specimen.

Macheropteris limatula, n. sp.

♂. 22 mm. Head brownish. Palpi brownish, slightly sprinkled with whitish points. Thorax brownish-ochreous sprinkled with dark fuscous. Abdomen dark grey. Forewings elongate, rather narrow, costa moderately arched, apex pointed, termen sinuate, very oblique; 7 to apex, separate, 9 and 10 remote; ochreous-brownish, some scales finely tipped with black; a broad streak of whitish-ochreous suffusion along fold from near base to beyond middle, and a rather elongate patch in disc beyond middle: cilia purplish-ochreous sprinkled with dark fuscous; basal third brownish-ochreous limited by a fine black line. Hindwings and cilia dark grey.

Hakgala, Ceylon, in April (Green); one specimen.

Macheropteris frenigera, n. sp.

♀. 24-25 mm. Head, palpi, and thorax whitish-fuscous suffused with darker and more or less mixed with dark fuscous. Abdomen rather dark grey, protruded ovipositor as long as abdomen. Forewings elongate, moderate, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 7 to apex, separate, 9 and 10 remote; light fuscous irrorated with dark fuscous, tending to form transverse strigulae; a transverse streak of dark fuscous suffusion from beyond middle of costa to dorsum before tornus: cilia whitish-fuscous, with several fuscous lines. Hindwings rather dark grey; cilia grey, with darker subbasal line.

Colombo, Ceylon, in November (Mackwood); two specimens.

Macheropteris vernacula, n. sp.

♀. 14 mm. Head, palpi, and thorax fuscous. Abdomen dark grey, apex ochreous. Forewings elongate, rather narrow, costa moderately arched, apex rounded-obtuse, termen obliquely rounded; 7 to apex, separate, 9 and 10 separate; lilac-brown, irrorated with dark fuscous: cilia brownish, with two dark fuscous lines. Hindwings dark purple-grey; cilia grey, with darker subbasal line.

Madulsima, Ceylon, in June (Green); one specimen.

Macheropteris melicera, n. sp.

♂ ♀. 21-30 mm. Head and palpi whitish-ochreous. Thorax whitish-ochreous, anteriorly suffused with fulvous-ochreous. Abdomen grey. Posterior tibiae in ♂ with moderate whitish-ochreous hairs. Forewings elongate, costa moderately arched, apex pointed, produced, termen sinuate, oblique; 2 and 3 sometimes connate or short-stalked, 7 to costa, 7 and 8 sometimes stalked, 9 and 10 remote; whitish-ochreous, more or less strewn with small ferruginous-ochreous spots and strigulae; costa suffused with ferruginous-ochreous towards base; sometimes two very oblique fuscous fasciae before and beyond middle respectively, edged with ferruginous-ochreous, and a streak running from lower extremity of first through middle of second to costa before apex, but these markings are sometimes very faintly indicated or quite obsolete: cilia whitish-ochreous mixed with

ferruginous-ochreous and sometimes sprinkled with dark fuscous. Hindwings and cilia rather dark fuscous.

Maskeliya, Ceylon (Pole); from January to July, six specimens.

PLUTELLIDÆ.

Lamyristis, n. g.

Head shortly rough-scaled; ocelli present; tongue absent. Antennæ $\frac{1}{3}$, in ♂ ciliated, basal joint short. Labial palpi moderately long, rather curved, somewhat ascending, second joint with compressed tuft of very long rough projecting scales beneath, terminal joint shorter, rather slender, obtuse. Maxillary palpi obsolete. Thorax with posterior expanded tuft of hair-scales. Abdomen in ♀ with large anal tuft. Anterior tibiæ moderately long, loosely expanded with scales, tarsi very short; posterior tibiæ with appressed scales. Forewings with 2 from towards angle, 7 and 8 long-stalked, 7 to termen, 9 and 10 from near 8, 11 from somewhat before middle. Hindwings 1, oblong-ovate, cilia $\frac{1}{2}$; 3 and 4 connate, 5-7 nearly parallel.

I describe this genus here, because superficially the species has considerable general resemblance to a *Machæropteris*, and also some points of curious similarity in structure, but I do not consider that there is any real connection. The true relationship of the genus is with *Anticrates*, Meyr.

Lamyristis leucopselia, n. sp.

♂ ♀. 17-20 mm. Head ochreous-whitish more or less mixed with fuscous. Palpi fuscous, tuft of second joint suffused with ochreous-whitish towards base. Thorax dark fuscous, posterior edge marked with white. Abdomen rather dark fuscous, anal tuft fuscous. Forewings elongate, moderate, costa rather strongly arched, apex obtuse, termen slightly sinuate, oblique; deep purple, suffusedly irrorated with dark fuscous; costal edge somewhat spotted with ochreous-whitish suffusion, especially on a patch before middle; a clear white spot on dorsum before middle, and two white dots placed transversely above it; a white dot on dorsum before tornus; three white dots on costa towards apex: cilia dark purplish-fuscous, with white patches above and beneath apex. Hindwings dark bronzy-fuscous; cilia fuscous, with dark fuscous subbasal line.

Maskeliya, Ceylon, in May (Pole, Alston); three specimens. The white patches in the cilia of forewings produce the optical effect of the unusual form of the apex and cilia in *Machæropteris phenax*.

(To be continued).

REPTILES COLLECTED IN CHITRAL.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Whilst stationed in Chitral in 1910, I managed to secure a good representative collection of the snakes of that State, and several lizards and batrachians. The region is by no means rich in species, but what there are are very abundant for the most part.

REPTILIA.

SQUAMATA.

Lacertilia.

Without making any special search for lizards, I managed to collect a few species.

Gymnodactylus stoliczkae (Steindachner).

This was by no means uncommon. I encountered it several times in the Fort at Drosh, among old packing cases or rubbish by day, and in the open after nightfall. Two fell into my basin at different times, and I came across others on the verandah floors when returning to my quarters at night. It is fairly agile.

Calotes versicolor (Daudin).

Rather uncommon. I saw but a few specimens at low elevations (4,000 to 5,000 feet). I noticed that the gular scales were distinctly keeled and that there was an oblique fold in front of the shoulder, though Boulenger (Faun. Brit. Ind., 1890, p. 136) says the gular scales are smooth or feebly keeled, and there is no fold in front of the shoulder. Chitral appears to be about the most northern limit from which this species has been recorded.

Agama tuberculata (Gray).

At an altitude of from 5,000 to 10,000 feet, this is as common in Chitral as it is in the Western Himalyas (Mussoorie, Almora). I found it up to about 12,000 feet.

Agama himalayana (Steindachner).

This was a very common lizard about Madaglasht, and I found it up to 11,000 feet or more. Like the last it lives among rocks coming out to bask in the sun, and scuttles into any cranny when disturbed. It is remarkable how it manages to capture butterflies as wary as the common painted lady (*Vanessa cardui*). On several occasions I found it devouring this species. Boulenger does not remark upon the peculiar and attractive colouration of the head, which is a rather bright yellow, and there is a large and conspicuously bright orange patch on each temporal region.

Varanus griseus (Daudin).

I had one specimen brought to me on the 25th May which measured 21 inches from snout to anus, and the tail, though slightly deficient, also measured 21 inches. Boulenger calls it a desert species, and makes no reference to it among hills, so that its occurrence in the heart of the Himalayas close to the Hindu Kush at an altitude of about 4,000 feet is noteworthy.

Lygosoma himalayanum (Günther).

At 10,000 feet this was a very common little lizard. Its numbers must be considerably checked by the pit-viper (*Ancistrodon himalayanus*) which preys upon it extensively.

OPHIDIA.

Snakes, though fairly abundant in Chitral, were represented by but few species. The name for a snake is "æe," a corruption of the Arabic name "afæe" I am told, but there is no Chitrali name for any of the species, not even the cobra which is very common.

COLUBRIDÆ.

Tropidonotus tessellatus (Laurenti.)

Three specimens of this species were captured near Mastuj in July at an altitude of about 6,000 feet. The species was plentiful there in a piece of ground adjoining a stream. I obtained it nowhere else.

Chitralis had told me that a snake frequents the hot springs in their country and I made every endeavour to get specimens. A cooly was sent on three occasions to the springs they were supposed to inhabit, but his labours were fruitless. I very much suspect that this snake is the one referred to, and that the water need not be hot to suit their tastes.

Two of my specimens were ♂♂, and the third a ♀. One killed between the 14th and 22nd July discharged two eggs during its death throes.

The ventrals and subcaudals were 182+66 and 180+67 in the ♂♂ and are not recorded in the third specimen.

The lepidosis in every respect agreed with that of the many Persian specimens I have examined. One specimen had swallowed a good-sized newt, that was too digested about the head to identify. As far as I am aware the species has never before been recorded East of the Hindu Kush and its known habitat is therefore much extended.

Dentition.—The *maxillary* in my skull supports 26 teeth in an uninterrupted series, the hinder gradually enlarged. This condition conforms to that of the genus *Nerodia* (Baird and Gir). *Palatine* 13 to 15. *Pterygoid* 17 to 19. *Mandibular* 26 to 28. It completely accords with my three Persian skulls.

Zamenis mucosus (Linné).

This is common, as much so perhaps as in most parts of India, but decidedly less numerous than *Z. diadema* in Chitral. I obtained 20 specimens of which 7 were ♂♂, and 13 ♀♀. The largest was a ♀ which measured 6 feet. A little one only 18 inches long when pursued by an Irish terrier faced round, and bit the dog most viciously. 6,000 feet was the highest altitude at which I obtained a specimen. Three specimens that had recently fed were found to contain toads (*Bufo viridis*) when dissected. Most of the examples had only two loreal shields (1+1), as in *korros*. In other parts of India it is quite unusual to find only two of these shields. In one specimen there was but one loreal on the left side with two on the right side. In one specimen there were 9 supralabials with the 5th and 6th touching the eye on the right side, and in another 9 with the upper part of a divided 4th, the 5th and 6th touching the eye on both sides. The ventrals in the ♂ were 194 to 197 and in the ♀ 192 to 202. The subcaudals in the ♂ were 112 to 119, and in the ♀ 109 to 122. The scales two heads-lengths behind the head were 17, in midbody 17 usually (once 16 and once 15), and two heads-lengths before the anus 12 or 14 (not influenced by sex). The rows became 16 invariably by the absorption of the vertebral into the adjacent row on the left side. In the succeeding steps the 3rd row above the ventrals disappears being absorbed into the 2nd usually (rarely the 4th).

Zamenis rhodorhachis (Jan.).

I collected 16 specimens all from elevations between 4,000 and 5,000 feet. Three of these conformed to variety *typica*, and the remainder to variety *ladacensis* (Anderson).

Of the 16, 7 were ♂♂, 8 ♀♀ and one was not sexed.

Variety *ladacensis* is extremely like the species *Z. ventrimaculatus* (Gray). So much so that I think it probable the two have been confused by most if not all writers hitherto. Boulenger (Faun. Brit. Ind., 1890, p. 326) says it differs in having more numerous ventrals and subcaudals, but that in other structural characters it agrees with *ventrimaculatus*. With this I cannot agree. In the first place the large series of both species that I have examined shows that no difference can be claimed in the respective ranges of the ventrals and subcaudals, and in the second place a very clear distinction can be shown in the dentition of the two species. Thus, in *rhodorhachis* a gap precedes the two last maxillary teeth which are much enlarged, but in *ventrimaculatus* no such gap exists and the posterior teeth are not enlarged.* This difference appears to me of sufficient importance to warrant generic distinction between the two.

I did not examine the dentition in every Chitral specimen, though I

* My skull is from a specimen killed at Campbellpore, Punjab.

did so in most. In all examined (both *typica* and *ladacensis*) there was a gap posteriorly in the maxillary array succeeded by two enlarged teeth. In this as in other respects they agreed with specimens I have seen from Karachi and Baluchistan.

I can find no constant differences in lepidosis, by which *rhodorhachis* can be distinguished from *ventrimaculatus*.

The details of my specimens are as follows:—

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-length after head.	Midbody.	2 heads-lengths before vent			
Variety <i>ladacensis</i> .								
25-10-09	♀	3'-8"	19	19	13	239	136	A lizard <i>Calotes versicolor</i> in the stomach.
5-11-09	♀	1'-2 $\frac{3}{4}$ "	19	19	13	221	?	Tail imperfect.
21-11-09	♂	4'-0 $\frac{1}{4}$ "	19	19	13	235	?	Tail imperfect. A large <i>Calotes versicolor</i> in the stomach.
29-11-09	♂	1'-6"	19	19	13	230	?	Tail imperfect. 126 subcaudals counted.
3-12-09	♂	1'-1 $\frac{7}{8}$ "	19	19	13	206?	112	
20-5-10	♂	2'-8"	19	19	13	208	?	Tail imperfect. 120 subcaudals counted.
23-5-10	♂	3'-2"	19	19	13	208	?	Tail imperfect.
24-5-10	♀	3'-0 $\frac{1}{4}$ "	19	19	14	213	?	Tail imperfect. Eight eggs in abdomen $\frac{13}{16}$ " \times $\frac{7}{32}$ ".
25-5-10	?	1'-2 $\frac{1}{2}$ "	19	19	15	213	?	Tail imperfect. A gecko probably <i>Gymnodactylus stoliczkae</i> in the stomach.
25-5-10	♀	2'-11"	19	19	15	220	115	Three eggs in the abdomen about $\frac{5}{8}$ inch long.
8-9-10	♀?	1'-0 $\frac{7}{8}$ "	19	19	13	221	?	Tail imperfect. 108 subcaudals counted.
23-9-10	♀	1'-1 $\frac{1}{4}$ "	19	19	15	216	118	
1-10-10	♂	1'-5 $\frac{3}{4}$ "	19	19	15	212	120	A young <i>Calotes</i> lizard in the stomach.

Date.	Sex.	Length.	Costals.			Ventral.	Subcaudals.	REMARKS.
			2 heads-lengths after head	Midbody.	2 heads-lengths before vent.			
Variety <i>typica</i> .								
12-6-10	♀	3'-4 $\frac{1}{4}$ "	19	19	15	222	122	Heavily gravid. Contained 9 eggs from 1 to 1 $\frac{1}{2}$ inches long with no trace of embryo.
17-9-10	♂	1'-10"	19	19	13	211	111	A gecko <i>Gymnodactylus stoliczkae</i> in the stomach.
6-10-10	♀	2'-10 $\frac{3}{4}$ "	19	19	13	215	113	

The costals reduce to 15 or 13 posteriorly irrespective of sex. In the reduction from 19 to 17 the 8th row above the ventrals is absorbed into the 7th usually (more rarely the 9th). From 17 to 15 the 3rd row above the ventrals disappears, being absorbed into the 4th usually (rarely the 2nd). These two steps occur quite close together, and may be reversed or mixed. When the rows still further reduce to 13, as is the rule, it is the 7th row above the ventrals that is absorbed. The supralabials are usually 9, the 4th divided, and its upper part with the 5th and 6th shields touch the eye. Rarely there are 8 in the series, and then the 3rd is divided, and with the 4th and 5th touches the eye. The tongue is pinkish with blackish tips. The eye has a narrow golden pupillary margin, with fine specks of gold interspersed through the iris. The ♂ claspers are beset with many falciform tentacles. The anal glands furnish a white secretion. In *ladacensis* the colour is olive-greyish, or olive-greenish, and there are usually 6 rows of quincunciate, small, blackish, round spots, most conspicuous anteriorly. Sometimes these spots are absent. There is usually a small round blackish spot at the side of each ventral especially marked in the anterior ones, but these may be absent. The belly is otherwise a pearly white, with sometimes some pinkish suffusion posteriorly. In variety *typica*, the vertebral stripe was a bright rosy pink in two specimens, but a brownish-red in the third. There are spots on the ventrals as in the last, and the belly was a pale creamy-yellow, or pale sulphur-yellow. I do not think there were any dorsal quincunciate spots, but I have failed to specially mention their absence in my notes. In both varieties there is a periorbicular buff zone, and the overlapped parts of the scales especially in the forebody are black basally, whitish apically. These hues show up only when the snake under excitement dilates itself, at other times they are quite concealed.

The species is remarkably slender in habit, wide awake, and active,

slipping away into cover so rapidly that it is difficult to capture alive. Many were killed in the Fort. The teeth were examined in Nos. 1, 5, 6, 7, 8, 14, 15 and 16. There were 13 or 14 maxillary teeth before the gap in Nos. 1, 5, 6, 7 and 16; and 10 or 11 before the gap in the remainder.

I have 6 skulls in my collection. The habitat of two is unknown, one is from Karachi and the rest from Chitral (Nos. 1, 8 and 16).

The dentition is as follows:—*Maxillary*—10 to 14 small teeth gradually increasing in size from before backwards, then a gap that would accommodate one tooth, followed by two enlarged, compressed and obliquely placed teeth, one-third longer to twice as long as the preceding. *Palatine*—9 to 11, slightly decreasing in size from before backwards. *Pterygoid*—15 to 24, slightly decreasing in size from before backwards (one in which habitat is unknown has 24, and No. 1 Chitral specimen has 22 and 23, all the rest from 15 to 18). *Mandibular* 15 to 20, the anterior and posterior slightly decreasing in size.

Zamenis ravergeri (Ménétr).

I collected 7 examples of this very elegant species at altitudes varying from about 9,000 to 11,000 feet. Of these 4 were ♂♂ and 3 ♂♂. I do not think it has been previously recorded East of the Hindu Kush, so that its habitat is materially extended. One specimen was picked up in a snow drift at about 11,000 feet apparently dead, but revived in the warmth of the hand. The details of the specimens follow:—

Date.	Sex.	Length.	COSTALS.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
5-7-10	♂	1' 9 $\frac{1}{8}$ "	21	21	16	206	?	Tail imperfect.
6-7-10	♀	3' 6"	21	21	15	220	88	
12-7-10	♀	3' 7"	21	21	15	223	83	The stomach contained the hair of some digested mammal.
14-7-10	♂	3' 8"	21	21	15	209	89	
14-7-10	♂	3' 10 $\frac{1}{2}$ "	21	21	15	212	96	Killed in the act of attacking a nest of fledglings some of which I found in the stomach.
14-7-10	♀	3' 4 $\frac{1}{2}$ "	21	21	15	218	87	
23-8-10	♂	3' 3 $\frac{3}{4}$ "	21	21	15	208	90	

In one specimen the 10th row above the ventrals divided, and fused several times in the anterior two-fifths of the body, the scales being therefore in 23 rows in places. I have noted the same thing once before in a specimen (No. 4609) in the Indian Museum, the 10th row again dividing at least once, the resulting rows reuniting later.

The young are especially handsome, with their very conspicuous, large, chocolate, or black spots in three series. These, and other markings become much less distinct with age, in fact may become very much obscured.

Several specimens reached me alive. I found them restless, active, and wary creatures, but playing with them cautiously none ever attempted to bite me.

In life the iris is speckled with gold, and exhibits a narrow orbit of gold around the pupil which is a horizontal ellipse in shape rather than a circle.

I prepared two skulls, and the dentition is as follows:— *Maxillary*—13 teeth gradually increasing in length from before backwards; followed by a gap that would accommodate one tooth, behind which are two enlarged, and obliquely set teeth about one-fourth longer than the immediately preceding. *Palatine*—9, very slightly reducing in length anteriorly and posteriorly. *Pterygoid*—14 to 19, gradually decreasing in length from before backwards. *Mandibular*—16 to 19, reducing in length anteriorly and posteriorly. I may mention here that nearly four years ago I received a fragment of a skin of this snake from Mr. (now Captain) C. H. Whitehead from near the Peiwar Kotal in the Kurram Valley, N.-W. Frontier, *circa* 7,000 feet. Mr. Whitehead told me he found fragments of a mutilated snake in the nest of a kite (*Milvus govinda*), and sent me about three inches of the skin. I wrote at the time that it was part of a snake quite unfamiliar to me which I thought would prove to be a species of *Zamenis*. The scale rows in the fragment counted 17 and 15. I pasted this fragment into my note-book, and recognised the first *ravergieri* I saw in Chitral as the same snake.

Zamenis diadema (Schlegel).

I think this is the commonest snake in Chitral at elevations up to about 4,000 to 5,000 feet. Writing recently on the snakes in the Quetta Museum, I commented upon at least three varieties of this snake. In Chitral I only saw one variety, *viz.*, *typica*, that ornamented with large brownish-black or

chocolate spots in three series. The species has, I believe, not been recorded up to date as far north as Chitral. A detail of the specimens follows :—

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
10-10-09	♂	2'-11"	27	29	19	241	?	Tail imperfect.
27-10-09	♂	..	25	29	17	243	104	
28-10-09	♀	4'-1"	27	31	21	248	?	Tail imperfect.
11-11-09	♀	4'-4 $\frac{1}{4}$ "	27	31	21	248	?	Tail imperfect.
17-11-09	♀	4'-11"	27	29	19	248	?	Tail imperfect.
17-11-09	♀	4'-3"	27	31*	21	255	?	Tail imperfect.
8-12-09	♂	3'-8"	25	29	19	240	?	Tail imperfect.
8-12-09	♀	3'-5"	..	..	..	..	..
12-2-10	♀	1'-8 $\frac{1}{2}$ "	27	31	21	254	103	Found on a cold wet day with deep snow on the ground.
2-3-10	♀	1'-4 $\frac{5}{8}$ "	25	29	19	252	103	
15-3-10	♂	4'-1 $\frac{3}{4}$ "	26	31	21	251	?	Tail imperfect.
1-4-10	♂	2'-6 $\frac{1}{2}$ "	25	29	19	239	?	Tail imperfect.
23-5-10	♂	4'-6 $\frac{5}{8}$ "	25	29	19	233	?	Tail imperfect.
27-5-10	♂	4'-2"	25	29	19	245	110	
28-5-10	♂	3'-11 $\frac{1}{4}$ "	27	31	19	239	104	
31-5-10	♂	4'-4"	27	31	19	241	106	
1-6-10	♂	4'-7 $\frac{3}{4}$ "	27	29	19	240	?	Tail imperfect.
8-6-10	♀	4'-1 $\frac{1}{2}$ "	25	29	19	247	?	Tail imperfect.
14-6-10	♂	3'-5 $\frac{3}{4}$ "	25	29	19	241	108	One tick (<i>Aponomma</i> Spec ?) found attached on the back.
25-6-10	♀	3'-6"	..	..	..	..	..

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
3-7-10	♂	5'-3 $\frac{1}{2}$"	..	..	..	..	..
10-7-10	♀	3'-2"	..	..	..	..	..
13-8-10	♀	3'-10"	28	31	21	250	?	Tail imperfect.
2-10-10	♀	2'-4"	25	29	19	252	104	

Of the 24 specimens 12 were ♂♂ and 12 ♀♀. Other specimens were sent to me in a state of putrefaction collected in Drosh, whilst I was absent at Madaglasht (—June to 21st September).

It is very remarkable that among all these specimens no single ♀ showed signs of being gravid, though all were dissected. Perhaps the breeding season was during the hot months when I was absent at the Sanatorium. The large number of imperfect tails in this, and other snakes is to be accounted for, by the Chitralis seizing this appendage, when the snake often screws itself loose leaving part of its tail behind. The costal rows are peculiar, being always fewer anteriorly than in midbody. Where the rows increase from 25 to 27, from 27 to 29 or from 29 to 31 the extra row appears on each side below the row adjacent to the vertebral, that is to say, where 25 becomes 27 a row appears between the 11th and 12th rows above the ventrals, where 27 becomes 29, it appears between the 12th and 13th, and where 29 becomes 31, it appears between the 13th and 14th. The reduction of rows is affected with one exception by the absorption of the 2nd row from the vertebral into one of its adjacent rows, *i.e.*, where 31 becomes 29, the 14th row above the ventrals disappears, where 23 becomes 21, the 10th row disappears. In one step the 3rd row above the ventrals is absorbed, and this is usually the second or third step in the reduction process; but as the first three steps occur close together, they are occasionally reversed or intermixed so far as the absorption of rows is concerned.

The ♂ claspers are furnished with cartilaginous, pedunculated processes. • The anal glands produce a custard-like material.

I found this species infested with small, encysted, white parasites about the size of lentils which were scattered all over the peritoneum. I submitted some to Professor A. E. Shipley, who reported that they were protozoa, probably sarcosporidia but possibly myxosporidia.

Naia tripudians (Merrem).

The cobra is a very common snake in Chitral up to about 5,000 feet elevation, and is chiefly represented by the variety *oxiana* of Eichwald. I have already referred to, and figured this variety in this Journal (Vol. XIX, p. 1001). It is peculiar in having no suspicion of a hood mark, and in being banded dorsally. The anterior two, three or four bands are black or blackish, and any succeeding ones brownish. In young specimens the bands are quite conspicuous to the vent. I have seen a specimen in our Society's collection from Aden and another from Parachinar on our N. W. Frontier. It was also the only variety of cobra I met with in Malakand some years ago.

I collected 16 specimens 5♂♂, and 11♀♀; some of these were killed inside the Fort at Drosh. One came into an officer's bed-room at night, and and on another occasion in camp one came after nightfall into an officer's tent. The furious barking of a chained terrier attracted our attention at dinner-time, and we found the cobra sitting up facing the dog. It was so taken up with the dog, that it ignored our presence even with a lighted lantern, and was despatched without any trouble. Another passed through my pony's legs one day in broad day-light, and only when I halted, did it erect itself. It struck me that its hood is not so expansive as in the binocellate variety usually seen in India.

The details of my specimens are as follows:—

Date.	Sex.	Length.	Scales.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
13-10-09	♂	1'-8"	19	19	15	195	69	
17-10-09	♀	3'-5"	23	22	15	210	62	
18-10-09	♀	2'-10 ⁵ / ₈ "	21	21	15	209	69	
20-10-09	♀	1'-4 ¹ / ₂ "	19	21	15	205	63	
24-10-09	♀	3'-2 ¹ / ₄ "	21	21	15	213	64	
2-11-09	♂	1'-7 ³ / ₈ "	20	21	15	206	69	
7-11-09	♀	1'-4 ³ / ₈ "	21	21	15	207	63	
11-11-09	♂	3'-1"	21	21	15	211	69	
21- 5-10	♀	1'-7 ¹ / ₄"	..	..	..	..	..

Date.	Sex.	Length.	Scales.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
24 -5-10	♀	1'-6 $\frac{5}{8}$"	..	..	..	..	..
24 -5-10	♀	3'-11"	21	21	15	207	60?	
3 -6-10	♂	3'-2 $\frac{1}{2}$ "	21	21	13	203	70	
5 -6-10	♂	4'-3"	19	21	14	207	63	
16 -9-10	♀	4'-9"	21	21	15	202	?	
28- 9-10	♀	1'-3 $\frac{1}{2}$ "	19	20	15	212	63	
5-10-10	♀	2'-6 $\frac{1}{2}$ "	21	21	15	207	68	

No specimen was gravid, but it is probable that the deposition of eggs took place during the months that I was away in the sanatorium at Madaglasht.

Most specimens were of rather a light shade of brown, but one was quite uniform black, the skin and scales alike. There was no suspicion of banding, and no hood marks.

VIPERIDÆ.

Ancistrodon himalayanus (Günther).

At 10,000 feet, up to 12,000 feet, I found this species as common as it is in other parts of the Western Himalayas. I do not think it has been recorded before west of the River Indus. I collected 33 specimens between June and September, 19 of which were ♂♂, and 14♀♀.

In my article on this snake in this Journal (Vol. XX, p. 65, et seq.) I remarked upon its very quiet disposition. The many living specimens I had in Chitral, some of which I had for weeks in captivity, serve to confirm my previous observations on its timidity. I encountered several in my walks abroad, and picked them up without one attempting to bite me. I played with several, trying to irritate them to bite, but to no purpose. It sometimes under irritation rubs one coil upon another in a restless fashion, reminding one of the characteristic motion elicited by the saw-scaled viper (*Echis carinata*). More rarely it agitated the tail tip as a demonstration of excitement.

It is difficult to see, when not in motion, its sombre hues harmonising very closely with those of its favorite bed, the needles of the various conifers that flourish about Madaglasht, the commonest of which is the spruce (*Picea morinda*). The silver fir (*Abies webbiana*) and the deodar (*Cedrus leban* var.

deodara) are also much in evidence at that elevation (*circa* 10,000 feet). The tongue in life is blackish with whitish tips. The secretion from the anal glands is of a dark-ochraceous colour, usually of the consistency of custard but sometimes inspissated so that it reminded one of pomade hongroise being expressed from a tube. In addition to this secretion, pressure behind the anus will, in a fresh specimen, sometimes eject a very fine jet of a limpid fluid, which is evidently stored in some quantity. I have noticed a similar limpid secretion in some other vipers.

In the annexed table of details it will be seen that the scale rows are normally 21 anteriorly, and 17 behind.

In 4 specimens the scale rows anteriorly were 19 in places, and in all the 4th and 5th rows above the ventrals had fused to reduce the normal number. The resulting scale divided, and the parts again fused, sometimes 3 or 4 times before the normal 21 rows were finally established.

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
28-6-10...	♂	1'-2 $\frac{3}{4}$ "	19	21	17	150	39?	A <i>L. himalayanus</i> in stomach.
4-7-10...	♀	1'-6 $\frac{1}{2}$ "	21	21	17	156	41	A mouse in the stomach.
4-7-10...	♀	7 $\frac{3}{8}$ "	21	21	17	149	36	Two <i>Scolopendra</i> in stomach.
4-7-10...	♀	6 $\frac{1}{2}$ "	21	21	17	148	38	
5-7-10...	♂	11 $\frac{1}{4}$ "	21	21	17	151	43	
5-7-10...	♀	7 $\frac{5}{8}$ "	21	21	17	155	35	15 ventrals between anal and the navel.
9-7-10...	♂	1'-3 $\frac{1}{4}$ "	21	21	17	146	41	
11-7-10...	♀	1'-2 $\frac{1}{3}$ "	19	21	17	?	38	
13-7-10...	♀	1'-9 $\frac{3}{4}$ "	21	21	17	156	36	
13-7-10...	♂	1'-7 $\frac{1}{4}$ "	21	21	17	154	38	
13-7-10...	♂	1'-3"	21	21	17	144	40	
13-7-10...	♂	1'-2 $\frac{3}{4}$ "	21	21	17	152	41	The tails of two <i>Lygosoma</i> in stomach.
14-7-10...	♂	1'-4 $\frac{1}{4}$ "	21	21	17	153	42	A <i>Lygosoma himalayanus</i> in the stomach.

Date.	Sex.	Length.	Costals.			Ventrals.	Subcaudals.	REMARKS.
			2 heads-lengths behind head.	Midbody.	2 heads-lengths before vent.			
14-7-10...	♀	1'-8 $\frac{1}{4}$ "	21	21	17	156	36	A mouse in the stomach.
15-7-10...	♂	1'-2 $\frac{5}{8}$ "	21	21	17	152	41	
20-7-10...	♂	1'-3 $\frac{3}{8}$ "	21	21	17	150	42	A large <i>Scolopendrum</i> in the stomach.
22-7-10...	♂	1'-3 $\frac{1}{4}$ "	21	21	17	150	43	
23-7-10...	♀	1'-4 $\frac{1}{4}$ "	21	21	17	153	36	
23-7-10...	♂	1'-3 $\frac{3}{4}$ "	21	21	17	150	39	A <i>L. himalayanus</i> in stomach.
24-7-10...	♂	1'-2 $\frac{1}{2}$ "	21	21	17	149	41	
29-7-10...	♂	1'-3 $\frac{1}{4}$ "	21	21	17	148	40	A <i>L. himalayanus</i> in stomach.
29-7-10...	♂	1'-2 $\frac{5}{8}$ "	21	21	17	154	41	
2-8-10...	♀	1'-8"	21	21	17	157	38	A mouse in the stomach.
5-8-10...	♀	1'-4 $\frac{1}{4}$ "	21	21	17	153	41	
25-8-10...	♀	1'-8 $\frac{3}{4}$ "	21	21	17	156	37	
25-8-10...	♀	1'-7 $\frac{5}{8}$ "	21	21	17	150?	36	Hair of a small mammal in stomach.
25-8-10...	♂	1'-2 $\frac{1}{2}$ "	21	21	17	?	40	
25-8-10...	♀	1'-5 $\frac{1}{8}$ "	21	21	17	158	35	Contained 4 foetus. 2 ♂♂ and 2 ♀♀, measuring 4 inches in length. The ♂ genitals extruded.
27-8-10...	♀	1'-6"	21	21	17	152	36	3 young in the abdomen, ♂ 5 $\frac{1}{4}$ ", ♂ 5 $\frac{3}{8}$ " and ♀ 5 $\frac{3}{8}$ ".
28-8-10...	♂	1'-5"	21	21	17	151	42	
4-9-10...	♂	1'-3 $\frac{5}{8}$ "	21	21	17	152	46	A <i>L. himalayanus</i> in the stomach.
4-9-10...	♂	1'-2 $\frac{1}{2}$ "	21	21	17	154	42	
-9-10...	♂	1'-2 $\frac{5}{8}$ "	21	21	17	149	44	

BATRACHIA.

ARCIFERA.

*Bufo*idæ.

Bufo viridis (Laurenti).

This is the common toad in Chitral, and was abundant inside the fort at Drosh in the summer. It was generally abroad at, or after, dusk.

CAUDATA.

Salamandridæ.

A newt occurs in Chitral, but I was unable to identify it. The one specimen I saw had been swallowed by one of the snakes *Tropidonotus tessellatus* captured near Mastuj. The head was a good deal digested, but the rest of the creature was intact.

A LIST OF INDIAN FUNGI, CHIEFLY OF THE BOMBAY
PRESIDENCY, WITH THE DESCRIPTION OF
TWO NEW SPECIES.

BY

E. BLATTER, S. J.

(*With a plate*).

The following is a list of Hyphomycetes, chiefly Basidiomycetes, which, about a year ago, I had sent to the Rev. F. Theissen, S. J., for identification. This gentleman was obliging enough to take the trouble of naming the specimens which were not always in the best state of preservation. Mr. C. G. Lloyd was so kind as to compare a great part of the Polyporaceæ with the material kept in Kew, and Mr. L. Romell of Stockholm identified several specimens. The Ascomycetes were examined by Dr. H. Rehm, and the Uredinales and Deuteromycetes by Mr. H. Sydow of Berlin. I wish to express my thanks to all who in some way or other lent us their kind help.

Rev. F. Theissen published a list of the fungi in the "Annales Mycologici" (Berlin, 1911, vol. IX, fasc. 2). As only a few, however, of those interested in Indian Botany and, at the same time, residing in this country are in a position to consult that Journal, we consider it advisable to publish the results in these pages. To the species mentioned in the "Annales" we shall add the names of some other fungi, which were collected between 1904 and 1906.

RETICULARIACEÆ.

Reticularia venosa, B. et C.

On dead wood.—In the ravines of Khandala (Western Ghats).—No. 72.

SPHÆRIOIDACEÆ.

Macrophoma Musæ, Berl. et Vogl.

On leaves of *Musa sapientum*, L.—Anand (Gujarat).—No. 85. Collected by Rev. H. Zurhansen, S. J.

Robillarda scutata, Sydow n. sp.

"Pycnidiis amphigenis, sine maculis, sparsis, rotundatis, 200-250 μ diam., atris, lenticularibus vel subdimidiatis, contextu minute celluloso;



INDIAN FUNGI.

1. *Polystictus xanthopus* Fr., seen from above.
2. " " seen from below.
3. Hymenium of *Polyporus umbilicatus* Berk.
4. Hymenium of *Lenzites ochroleuca* Lév. (lenzitoid form).
5. " " (polyporoid form near the base, passing over into the lenzitoid form near the periphery).

sporulis subfusoides, utrinque acutiusculis, leniter curvulis vel inæquilateralis, medio spurie 1-septatis, hyalinis, apice setulas duas hyalinas late divergentes tenues ca. 12-15 μ longas gerentibus, cellula basali interdum caudata, 14-17 \sphericalangle 2-3 μ ; basidiis brevissimis, vix visibilibus.

This species does not represent a typical *Robillarda*, but, in consequence of the flat and almost shield-shaped pycnidia, it must be considered as forming a transition to the *Leptostromataceæ*. We can, nevertheless, class it under the *Sphærospideæ*, because the pycnidia scarcely show anything of the typical radial structure of the *Leptostromataceæ*."

On dead leaves of *Mimusops hexandra*.—Anand (Gujarat).—No. 83. Discovered by the Rev. H. Zurhausen.

USTILAGINACEÆ.

Ustilago Tritici (Pers.) Jensen.

On wheat.—Anand.—No. 93; Malakwar (Punjab).

UREDINACEÆ.

Aecidium Parvettæ, Kjk.

On Pavetta sp. October and November 1906.—Matheran.—No. 161.

AURICULARIACEÆ.

Auricularia polytricha, Mont.

On stems.—Near Kanheri Caves (Salsette).—No. 170 and 102.

Auricularia mesenterica, (Dicks.) Fr.

On dead wood.—Bandora; Khandala.—No. 81.

Auricularia sambucina, Mart.

On stems.—Khandala (Western Ghats).—No. 100.

DACRYOMYTACEÆ.

Dacryopsis sp.

Sporophores densely arranged, simple, cartilaginous, reddish-yellow, 1, 5 mm. high. Stem 1, 2 mm. high, red at the base, 350 μ in diameter, upwards lighter, 250 μ in diameter. Capitulum spherical, O, 5 mm. in diameter, red. Sterile.

On bark.—Mount Pedro (Ceylon).—April 1909.—No. 171.

THELEPHORACEÆ.

Corticium cfr. **cæruleum** (Schrad.) Fr.

Khandala (Western Ghats).—No. 69.

Stereum hirsutum (Willd.) Fr.

On stems.—Khandala.—No. 157.—Dehra Dun, U. P.—No. 8.

Stereum elegans, Mey.

On wood.—Khandala.—No. 78 and 88.

Stereum lobatum, Fr. forma.

On stems.—Khandala.—No. 8.

Stereum annosum, B. et Br.—Khandala.

Hymenochaete strigosa, B. et Br.

On bark.—Khandala.—No. 106.

HYDNACEÆ.

Irpex flavus, Kl. (*Polystictus flavus*, Jungh.)

On branches of trees.—Khandala. No. 4 and 66.—Salsette.—No. 136 and 141.—(Has also been found in Africa, Ceylon, Java, Samoa, Australia.)

Irpex vellereus, B. et Br.

On wood.—Khandala.—No. 98.

Irpex canescens, Fr.

On wood.—Khandala.—No. 67 and 68.

POLYPORACEÆ.

Ganoderma applanatum (Pers.) Wallr.

On stems.—Khandala.—No. 159.—(Cosmopolitan).

Ganoderma lucidum (Leys.) Fr.

On stems.—Victoria Gardens, Bombay.—No. 121.

Ganoderma resinaceum (Bod).

Pileus up to 12 cm. broad, Pores 4-5 to 1 mm, whitish, later on brown, 8-10 mm. long. As regards texture, colour, crust, and spores fully identical with the European *Ganoderma lucidum* and, according to Mr. Lloyd's notes, only a stipeless form of the latter. Pileus laterally attached, with or without concentric sulcate zones.

On old stem.—Andheri (Salsette).—No. 154.—Bandora.—No. 51.

Polyporus isidioides, Berk.=*P. gilvus*, Schw.

This is not the Typical *Gilvus*-form, but cannot, according to Mr. Lloyd, be separated from it. The pileus of Father Theissen's Brazilian type specimens are light brown, radially furrowed, passing into yellow towards the margin; the margin itself is sharp, not bordered.

In the Indian specimens the surface is of a sienna shade with transitions into darkbrown; the zones are concentric and the margin rounded, border-like and golden yellow. As to texture, pores, etc., they agree perfectly with *P. gilvus*.

On dead stems.—Khandala.—No. 75 and 160.

Polyporus cubensis, Mont.

According to Mr. Romell scarcely different. Pileus thin, half-circular, wood-coloured, concentrically furrowed in the peripheric half, crossed by radiating furrows; in the central part smooth, clay-coloured. Pores darker, roundish, ca. 5 to 1 mm.; sterile margin narrow, lighter.

On wood.—Dehra Dun, U. P.—No. 142.

Polyporus Persoonii, Fr. forma.

Pilei 3-5 cm. in circumference, imbricate, or one parallel behind the

other, reflex, sometimes resupinate; pores sometimes lenzitoid, running in different ways.

As to the other characters fully agreeing with Father Theissen's Brazilian specimens.

On dead stems.—Andheri (Salsette).—No. 131 and 132.

Polyporus umbilicatus, Berk.

According to Mr. Lloyd approaching the European *P. lepideus* Fr. Pilei 3-6 cm. in circumference, often grown together, but the stipes free. Stipe central, 4-5 cm. long, 2-3 mm. in diameter, reaching almost 5 mm. towards the upper end, smooth. Pores 4 to 1 mm.

On Wood.—Compound of St. Xavier's College, Bombay.—No. 116 and 151.

Polyporus aff. grammocephalus, Berk.

According to Mr. Lloyd different as to the way of growing, otherwise closely allied to grammocephalus. The differences between the specimens of Ule's *Mycotheca brasiliensis* and the Indian specimens are considerable. Pileus fan-shaped or semicircular, 3-6 cm. in circumference, with a short stout stipe. Pileus 4 mm. thick, of which 1-15 mm. belong to the hymenium. Upper surface pretty rough. Pores ca $2\frac{1}{2}$ —3 to 1 mm., (in Ule's specimens 6).

On stems.—Poona.—Aug. 1906.—No. 162.

Polystictus russogramme, Berk.

On wood.—Khandala.—No. 115.

Polystictus occidentalis, Kl. f. *resupinata*.

On decaying wood.—Bandora.—No. 9.

Polystictus occidentalis Kl. f. *tenuis*.

"Ad *P. gibberulosum* valde accedens, nisi idem." (Romell).

On branches.—Bombay.—Aug. 1908.—No. 166.

Polystictus floridanus, Berk, forma.

Differs slightly by the brownish-red colour of the hymenium.

On wood.—Dehra Dun.—No. 173.

Polystictus zonatus (Koen.), Berk.

On branches.—Bombay.—Aug. 1908.—No. 164.

Polystictus sanguineus (L.), Mey.

On stems.—Dehra Dun.

Polystictus leoninus, Kl.

On stems.—Anand (Gujarat).—No. 82.—(Collected by Rev. H. Zurlauben).

Polystictus zeylanicus, Berk.

On branches.—Khandala.—No. 76.

Polystictus xanthopus, Fr.

On stems.—Simla.—April 1907.—No. 124 and 148.

No. 124: Pileus $3\frac{1}{2}$ cm. in diameter, O, 5 mm. thick, reddish-yellow, with

broad dark red concentric zones; stipe central; pores greyish-white, 5-6 to 1 mm. Sterile margin 1 mm. broad, white.

No. 148: Pileus semicircular, 8 cm. in diameter, dark golden yellow, with many narrow zones of almost the same colour; stipe almost lateral; pores dark bluish-grey, 4-5 to 1 mm. Sterile margin 2-2½ mm. broad, wood-coloured.

Grevillea, vol. 14, p. 78, gives the following synonyms: *P. crassipes* Curr., *P. Cupreonitens*, Kalchb., and vol. 15, p. 56: *P. Katui*, Ehr. This species is widely distributed in Australia and Africa (cf. Torrend in 'Broteria,' 1905, p. 218).

Polystictus ? senex, Mont.

'Forma junior, crassior, obtusa, azona' (Romell.)

On old stem.—Compound St. Xavier's College, Bombay.—Oct. 1907—No. 146.

Polystictus sarawacensis, Berk—Khandala.

Hexagona tenuis, Hook.

On wood.—Khandala (Western Ghats)—April 1907—No. 157—Bassein—Sept. 1907—No. 135 and 137.

Different forms; pores 5-9 to 5 mm.; zones of pileus sometimes almost disappearing.

Hexagona polygramma, Mont.

On wood.—Khandala (Western Ghats).—No. 152.

Large-pored form of *H. tenuis*. (cf. Lloyd, Synopsis 1910); Pores 3 to 5 mm.

Lenzites ochroleuca, Lév.

(*Hexagona glabra* Lév., cf. Lloyd, Synopsis 1910, p. 31.)

On stems.—Bombay, Aug. 1908, No. 163—Khandala, No. 56 and 150.

Various hymenial forms. *Dædalea aulacophylla*, Berk. Salsette, No. 52.

The faint zones disappear sometimes entirely.

Lenzites repanda Pers.

On stems.—Dehra Dun, U. P., No. 155—Simla, No. 134.

In the latter form storeyed arrangement of the pilei. In the first the pileus with central stipe.

No. 150 represents a form which differs by the umbrine, much-zoned upper side of the pileus; as to the other characters it agrees with the type. Perhaps another species?

AGARICACEÆ.

Marasmius spaniophyllus, Berk.

On branches.—Khandala (Western Ghats).—No. 59.

Xerotus lateritius, B. et C.

On dead branches.—Khandala.—No. 145, 127.

According to Mr. Lloyd probably identical with *Xerotus nigratus*, Fr.

[*Anthracophyllum nigratum* (Lév.) Kalch.] The same species was found several times in Brazil by Father Theissen.

(Occurs in North America, Cuba, South America, Australia.)

Xerotus griseus, Berk.—Khandala.

Schizophyllum alneum, (L.) Schröt.

On dead wood.—Poona, No. 172—Bombay, No. 57 and 164.

Lentinus aff. subnudus, B.

On dead stem.—Khandala (Western Ghats).—No. 147.

‘Ex specim. Kew valde affines videntur *L. subnudus*, *cæspitosus*, *Curreyanus*, *manipularis*, *multiformis*, et porte omnes ad *L. cretaceum* ducendi.’ (Romell).

Pileus up to 9 cm in circumference. Scales well developed in the centre of the upper surface of the pileus, but gradually disappearing towards the periphery. Lamellæ very narrow, ca. $2\frac{1}{2}$ mm. broad, with sharp edge. Stipe 4-12 mm. in diameter, seems to have been covered with scales. All the pilei of the dried specimens show deep depression in the centre. Original colour not known. Pileus and lamellæ straw-coloured; stipe lighter. Edge of lamellæ with a brown shade.

Collybia stipitaria, Fr.

On wood.—Simla, April, 1907.

Lepiota sordescens, B. et C.

On the ground.—Salsette.—No. 54.

Lepiota Badhami, Berk.—Thana.—No. 162.

Spores white, broadly-elliptical, $8-9 \searrow 6-7 \mu$.

PHALLACEÆ.

Dietyophora phalloidea, Desv.

On the ground.—Khandala.

HELVELLACEÆ.

Morchella conica, Pers.

On the ground.—Dehra Dun, U. P.—No. 95.

Spores $26-28 \searrow 12-14 \mu$ with thin mucous coat, elliptical rounded, uniseriate. Asci 16-20 μ broad. Paraphyses club-shaped.

HELOTIACEÆ.

Sarcoscypha sp.

On the ground.—Khandala.—No. 120.

There were only two sterile specimens preserved in alcohol and it was, therefor, impossible to distinguish the species.

Mr. Rehm makes the following remarks: “Hymenium totally undeveloped; even the youngest specimens show beautiful hairs, which are long, colourless, almost entirely thickwalled, scarcely showing a furrow in the interior, unseptate and pointed.—Approaches *Sarcoscypha Racovitze*, Bemm. Rouss. (Sacc. XVI, 713), but, taking their description, cannot be identical

with it; the following show similar relationships: *Peziza aluticolor*, Berk. [= *Sarcoscypha Colensoi*, Berk. = *Sarcoscypha melanopora*, B. et C. = *Peziza lachnoderma*, Berk. (sec. Massee, Linn. Soc. 31, p. 504)], *Peziza semitosta*, B. et C. [= *Peziza Hainesii*, Ell. = *Macropodia semitosta*, Sacc. VIII, 159 (cf. Durand, Journ. Myc. XII, p. 31)].

AMPHISPHERIACEÆ.

Amphisphaeria khandalensis, Rehm n. sp.

Perithecia applanato-globosa, parum immersa cortice velut annulo denigrato breviter cincta, lævia, nigra, papillâ obtusâ instructa, ca. 700 μ diam. Asci fusiformes, p. sp. 120-150 \simeq 8-9 μ (sporidiis 2-3-stichis) usque 200 \simeq 5-6 (sporidiis monostichis). Paraphyses densissimæ, hyalinæ, simplices flexuosæ, Sporæ fusoides, utrinque aciculares, fuscæ, 1-septatæ, ad septum vix constrictæ, typice ex utraque septi parte guttulâ unâ contiguâ præditæ, 42-52 \simeq 4½-5 μ .

On bamboos.—Khandala (Western Ghats).—Oct. 1906.

"Approaches *Amphisphaeria Edamensis*, P. Henn. (Sacc. Syll. XVI, p. 506), which, however, has got "sporas 50-65 \simeq 9-10 μ , medio constrictas." *Amph. botulisporea* (Cke.) (Syll. I. p. 719), too, has larger and broader spores, the cells of which are unequal." (Rehm).

XYLARIACEÆ.

Xylaria dealbata, B. et Br.

On wood.—Khandala.—No. 108.

Xylaria piperiformis, Berk.

On wood.—Bombay.—No. 110.

Hypoxyylon vividum, B. et Br.

Stroma pulvinato-effusum, rubro-cinnabarinum, margine lætiore miniato, vix 2 mm. crassum, fere totum peritheciis constans, stromate ferrugineo basilari parco, contextu fumoso-nigro molliusculo, extus verticibus subprominentibus nitide leniter colliculosum, haud nitens. Perithecia oblonga erecta, 1500-1800 μ altis, 300-400 μ latis, basin versus usque 250 μ attenuatis, ostiolo minuto pertuso. Ascis cylindræis, apice rotundatis, p. sp. 100-200 \simeq 8-9 μ , desuper in pedicellum delicatum, usque 150 μ longam attenuatis. Sporæ recte vel oblique monostichæ, ellipticæ vel planoconvexæ, obscure brunneæ, continuæ, pluriguttulatæ, 15-18 \simeq 7-8 μ . Paraphyses longissimæ, hyalinæ, filiformes, simplices, 1-1, 5 μ cr.

On bark.—Bombay, 1907.—No. 122.

Camillea bacillum, Mont.

On bark.—Khandala (Western Ghats).—No. 58.

Daldnia concentrica (Bolt.), Ces. et DN.

On stem.—Andheri (Salsette).—No. 112 and 133.

Spores dark brown, mostly plano-convex, 12-15 \simeq 5-6 μ .

NOTES ON THE BIRDS OF SEHORE, CENTRAL INDIA, WITH SPECIAL REFERENCE TO MIGRATION.

BY

CAPTAIN C. H. T. WHITEHEAD.

Sehore is a small cantonment in Bhopal State on the plateau of Central India. It is situated in a slight hollow surrounded by mango groves and gardens on the bank of the Siwan Nullah and three miles west of a low ridge (about 100 feet high) which divides the waters of Bengal and Bombay.

The surrounding country is gently undulating, broken by occasional rocky outcrops (the highest of which only rises about 450 feet above the plain), and covered for the most part with thin scrub and grass, except to the south, where, 6 miles out, jungle averaging some 15 to 20 feet in height commences, stretching thence to the Vindhya. In this tract Her Highness the Begum of Bhopal has generously set apart a tiger preserve, known as Lotia, for the Europeans of Sehore, the Kolar River drains it, and this is a paradise for many interesting forest birds.

The soil is a stiff black cotton one and cultivation is not very extensive, except in the more favoured parts, *e.g.*, around Sehore and Ashta. Several small streams run through the District, but there are few tanks except the Big Lake at Bhopal, 20 miles east, the series of small ones around Akodia 40 miles west, and Ashta 27 miles south-west; fortunately the two former are easily accessible by railway, and the first with its gently shelving shore and excellent feeding appears to be specially attractive to waterfowl, judging by their very late stay there.

August is the only month in which I did not visit the Bhopal Lake. From 20th of February till the 31st of July I visited it practically every week.

The annual rainfall averages roughly 50 inches, and mostly occurs between the 20th of June and the 30th of September. The climate, owing to the altitude—some 1,700 feet—and the absence of rock near the surface, is comparatively cool and in winter there are usually slight frosts.

Instead of just giving a list of the birds, I have divided them into groups in accordance with Mr. Kinnear's Migration Circular as under :—

I.—True Migrants, these number ...	70	(122)
II.—Migrants ,, ,, ...	32	(80)
III.—Partial Migrants ,, ,, ...	38	(39)
IV.—Residents	141	(78)
V.—Doubtful, whether Migrants or not.	13	(23)
<hr/>		
Total...	294	Total... (342)

The figures in brackets are the corresponding ones for the Kohat District, N.-W. F. P.; these show what a much larger proportion of the birds of the N.-W. are migrants.

The total number of species collected and observed is 294, but the list is far from exhaustive (especially as regards forest birds), as I did not have too much spare time to devote to birds during my stay at Sehore (April 1908 to August 1910.)

The chief points which have struck me are as follows :—

1. The extraordinarily late stay of migratory waterfowl.
2. How certain common birds generally considered resident entirely disappear during the monsoon, and how certain others only appear at that season.
3. That some species judging by the records of previous observers are extending their ranges, *e. g.*, *Luscinola melanopogon*, *Merula atrigularis*, *Anthus richardi*, *Emberiza stewarti*.

All references are to Oates' and Blanford's "Fauna of British India Birds" (abbreviated O. & B.). The numbers before the scientific names are those used in that work.

Unless noted to the contrary none of any species were observed between the date of departure and that of arrival, but except where otherwise stated they remained present between the dates of arrival and departure, *i.e.*, were not merely birds of passage. My best thanks are due to Major H. A. F. Magrath for kindly correcting the manuscript and to Mr. Ogilvie Grant for promptly, verifying in the British Museum my identifications of specimens collected.

I.—TRUE MIGRANTS.

	Date of Arrival.	Date of Departure.
362. <i>LOCUSTELLA STRAMINEA</i> , The Turkestan Grasshopper Warbler. Put up several in long grass on January 16th and shot one .. .. .	....	Jan. 16
367. <i>ACROCEPHALUS AGRICOLA</i> , The Paddy Field Warbler. Common in reed beds all winter ..	Nov.	Apr. 17
377. <i>LUSCINIOLA MELANOPOGON</i> , The moustached Sedge Warbler. Fairly common in reed beds.	Dec.	Mar. 6
407. <i>PHYLLOSCOPUS TRISTIS</i> , The Brown Willow Warbler. Common	Nov. 22	Apr. 7
408. <i>PHYLLOSCOPUS INDICUS</i> , The Olivaceous Willow Warbler. Rather scarce, usually seen singly or in pairs, but on 3rd April I saw about twelve in one bush. Though unlike a typical <i>Phylloscopus</i> in habits (<i>vide</i> Oates and Blanford), still it closely resembles <i>P. tickelli</i> in notes and habits as well as in colouring, and it is its note which generally leads to its discovery	Oct. 25	Apr. 3
420. <i>ACANTHOPNEUSTE NITIDUS</i> , The Green Willow Warbler. Common until the end of October, not noted later, or in spring	Sept. 20	....
479. <i>LANIUS ISABELLINUS</i> , The Pale Brown Shrike. Rather scarce	Nov.	Mar. 6
481. <i>LANIUS CRISTATUS</i> , The Brown Shrike. A fairly common winter visitor, date of departure not noted	Oct. 18.	....
528. <i>PASTOR ROSEUS</i> , The Rosy Pastor. Common, large flocks pour in as the jowari ripens towards the end of November	Oct. 17	May 5
532. <i>STURNUS MENZBIERI</i> , The Indian Starling. Saw one flock on the 12th of December 1908, that is all .. .. .	....	....
561. <i>SIPHIA PARVA</i> , The European Red-breasted Flycatcher. Abundant	Sept. 28	Apr. 15
620. <i>SAXICOLA OPISTHOLEUCA</i> , Stricklands Chat. Common	Oct. 3	Mar. 28
625. <i>SAXICOLA ISABELLINA</i> , The Isabelline Chat. Common during their stay, date of departure not noted, but certainly common up till January 16th.	Nov. 7	Jan. 16
626. <i>SAXICOLA DESERTI</i> , The Desert Chat. Same as No. 625	Nov. 2	Jan. 16

	Date of Arrival.	Date of Departure.
642. <i>CYANECULA SUECICA</i> , The Blue Throat. Common but chiefly in reed beds	Oct. 14	Apr. 7
677. <i>MERULA ATRIGULARIS</i> , Black-throated Thrush. Only one seen (this is now in the British Museum)	Dec. 12	....
795. <i>EMBERIZA BUCHANANI</i> , The Grey-necked Bunting. Common in scrub	Oct. 10	Apr. 28
800. <i>EMBERIZA LUTEOLA</i> , The Red-headed Bunting. Common probably arrived much earlier.	Nov. 24	Apr. 3
826. <i>MOTACILLA ALBA</i> , The White Wagtail. Common, stays well in to April I believe	Sept. 30	Mar. 13
833. <i>MOTACILLA BOREALIS</i> , The Grey-headed Wagtail. Arrival not noted but flocks of immature yellow wagtails arrived in last week in September. Only common in March and April .. .. .	....	May 1
835. <i>MOTACILLA BEEMA</i> , The Indian Blue- headed Wagtail. Same as 833 .. .. .	....	May 1
836. <i>MOTACILLA FELDEGGI</i> , The Black-headed Wagtail. Not very common	Nov. 15	Mar. 23
837. <i>MOTACILLA CITREOLA</i> , The Yellow-headed Wagtail. Abundant about the reed beds and marshes	Sept. 28	Apr. 17
840. <i>ANTHUS TRIVIALIS</i> , The Tree Pipit. Abun- dant. <i>A. maculatus</i> probably also occurs, but with- out shooting they are difficult to distinguish from <i>A. trivialis</i>	Sept. 20	Apr. 21
845. <i>ANTHUS RICHARDI</i> , Richard's Pipit. Only one met with (this is now in the British Museum). Perhaps overlooked owing to its close resemblance to the next species .. .. .	....	May 22
846. <i>ANTHUS STRIOLATUS</i> , Blyth's Pipit. Fairly common in cold weather. Departure not noted	Sept. 6	....
848. <i>ANTHUS CAMPESTRIS</i> , The Tawny Pipit. Fairly common	Oct. 10	Apr. 3
862. <i>CALANDRELLA BRACYDACTYLA</i> , The Short- toed Lark. Abundant on uncultivated lands ..	Nov. 7	Mar. 25
1189. <i>PANDION HALIAETUS</i> , The Osprey. Not common. Date of departure not noted	Oct. 25	....
1233. <i>CIRCUS MACRURUS</i> , The Pale Harrier. Common	Sept. 23	Apr. 17

	Date of Arrival.	Date of Departure.
1237. <i>CIRCUS AERUGINOSUS</i> , The Marsh Harrier. Very common. Harriers are not supposed to perch, but this species is frequently to be seen perched on dead bushes about the Bhopal marsh.	Oct. 7	May 14
1241. <i>BUTEO DESERTORUM</i> , The Common Buzzard. A scarce winter visitor, dates of arrival and departure not noted .. .. .	....	....
1254. <i>FALCO PEREGRINUS</i> , The Peregrine Falcon. Occasionally seen about jheels and tanks ..	Dec. 28	Feb. 20
1350. <i>COTURNIX COMMUNIS</i> , The Grey Quail. Common chiefly around jheels. Probably arrives much earlier and departs later than the dates given.	Nov. 7	Mar. 6
1393. <i>PORZANA PUSILLA</i> , The Eastern Ballon's Crake. Apparently not common .. .. .	....	Apr. 21
1394. <i>PORZANA MARUETTA</i> , The Spotted Crane. Only two or three observed but possibly fairly common	Nov. 10	Feb. 27
1407. <i>GRUS COMMUNIS</i> , The Common Crane. Scarce. Not observed on migration .. .. .	....	....
1411. <i>ANTHROPOIDES VIRGO</i> , The Demoiselle Crane. A flock of about 100 frequented the Bhopal Jheel for a month in the spring .. .. .	....	Mar. 20
1438. <i>CHETTUSIA LEUCURA</i> , The White-tailed Plover. Common about marshes	Oct. 7	Mar. 20
1454. <i>NUMENIUS ARQUATA</i> , The Curlew. Rather scarce	Nov. 7	Apr. 10
1455. <i>NUMENIUS PHAEOPS</i> , The Whimbrel. Only observed on these two dates, a single one each time	July. 13	May 22
1456. <i>LIMOSA BELGICA</i> , The Black-tailed Godwit. Occurs in big flocks in spring and autumn—the majority depart early in May but there were still four on the Bhopal lake on June 12	Oct. 25	June 12
1461. <i>TOTANUS GLAREOLA</i> , The Wood Sandpiper. Present throughout the year, though none I think breed—scarcest in July, but even in July from thirty to fifty remain .. .. .	....	....
1462. <i>TOTANUS OCHROPUS</i> , The Green Sandpiper. Abundant	July 31	June 23
1463. <i>TOTANUS STAGNATILIS</i> , The March Sandpiper. Not common. Date of arrival not noted.		

	Date of Arrival.	Date of Departure.
Only occurs in autumn and spring. Three stayed on till July 3rd .. .. .	....	July 3
1403. TOTANUS CALIDRIS, The Redshank. Common. Three had returned by July 24th and several more by the 31st	July 24	Apr. 10
1465. TOTANUS FUSCUS, The Dusky Redshank. Common	Sept. 24	May 1
1466. TOTANUS GLOTTIS, The Greenshank. At least two pairs stayed up till July 31st (the date of my last visit) and probably did not migrate at all. Cannot say whether they nested—they cer- tainly paired	Oct. 7	July 31
1468. PAVONCELLA PUGNAX, The Ruff. Com- mon, had returned by 31st July	July 31	Apr. 17
1471. TRINGA MINUTA, The Little Stint. Common but chiefly in spring and autumn. Plenti- ful up to date of departure	Sept. 24	May 22
1474. TRINGA TEMMINCKI. Temminck's Stint. Same as No. 1471.	Sept. 26	June 5
1478. TRINGA ALPINA. The Dunlin. Common	Sept. 26	....
1484. GALLINAGO CÆLESTIS. The Common Snipe. Common from Oct. 7th up till Apr. 17th	Oct. 7	May 1
1485. GALLINAGO STENURA, The Pintail Snipe. Always looked out for it when shooting, but only Saw two which were both shot on 13th January ..	....	....
1487. GALLINAGO GALLINULA, The Jack Snipe. Common but less so than 1484	Oct. 7	Mar. 13
1496. HYDROCHELIDON HYBRIDA, The Whis- pered Tern. Scarce—observed single birds on these two dates only.. .. .	Sept. 3	June 12
1550. LEPTOPTILUS DUBIUS, Adjuant. Com- mon from May till August at least.. .. .	May 14	....
1574. BOTAURUS STELLARIS, The Common Bit- tern. Fairly common in reed beds	Nov. 21	Apr. 10
1579. ANSER FERUS, The Grey Lag Goose. Reported to be common along the Nerbudda. Not personally observed .. .. .	....	....
1583. ANSER INDICUS, The Barred-headed Goose. Not common but flocks seen on Bhopal and Akodia jheels	Oct. 25	....

	Date of Arrival.	Date of Departure.
1588. CASARCA RUTILA, The Brahminy Duck. Fortunately not very common	Oct. 31	....
1595. CHAULELASMUS STREPERUS, The Gad- wall. Common up till May 1st, and I believe later.	Nov. 10	May 1
1599. MARECCA PENELOPE. The Wigeon. Not very common	Oct. 7	May 1
1600. DAFILA ACUTA, The Pintail. Very com- mon. The majority left in March and April, but a flock varying from six to twenty remained on through May and till 12th June	Oct. 25	June 12
1601. QUERQUEDECUA CIRCIA, The Garganey Teal. Very common in autumn and spring. More than a hundred remained on Bhopal lake till the end of June. Three pairs and one odd one re- mained, stayed throughout July (still there on 31st the last time I visited the lake). One shot (skin preserved) on July 2nd	Oct. 7	July 31
1602. SPATULA CLYPEATA, The Shoveller. Common up till the end of April. One pair at least stayed till June 12th	Oct. 27	June 12
1604. NETTA RUFINA, The Red-headed Po- chard. Common. Probably arrives much earlier..	Dec. 5	Mar. 20
1605. NYROCA FERRINA, The Common Po- chard. Common	Nov. 21	Mar. 30
1609. NYROCA FULIGULA, The Tufted Duck. Common till April—8 stayed in Bhopal Lake till May 1st and 1 pair was constantly seen till July 31st	Nov. 10	July 31

II.—MIGRANTS.

363. ACROCEPHALUS STENTOREUS, The Indian Great Reed Warbler. Common in November, December and April—not seen between December and April	Nov. 10	Apr. 21
365. ACROCEPHALUS DUMETORUM, Blyth's Reed Warbler. Common till the end of October, especially in gardens—not noted in spring ..	Sep. 20	....
395. HYPOLAIS RAMA, Syke's Tree-Warbler. Common till mid-November and again in February and March	Oct. 7	Apr. 14
396. HYPOLAIS CALIGATA, The Booted Tree- Warbler. Same as 395	Oct. 7	Mar. 25

	Date of Arrival.	Date of Departure.
399. SYLVIA JERDONI, The Eastern Orphean Warbler. Fairly common in March .. ..	....	Mar. 25
402. SYLVIA AFFINIS, The Indian Lesser White-throated Warbler. Very common up till the end of March	Oct. 10	Apr. 21
418. PHYLLOSCOPUS HUMII, Hume's Willow-Warbler. Same as 402	Sept. 20	Apr. 6
422. ACANTHOPNEUSTE VIRIDANUS, The Greenish Willow-Warbler. Common	Oct. 9	Mar. 17
428. ACANTHOPNEUSTE OCCIPITALIS, The Large Crowned Willow-Warbler. Fairly common ..	Sept. 28	Mar. 11
495. PERICROCOTUS BREVIROSTRIS, The Short-billed Minivet. Seen occasionally in winter but scarce .. ..	....	....
610. PRATINCOLA MAURA, The Indian Bush-Chat. Common especially on migration	Sept. 12	Apr. 17
618. SAXICOLA PICATA, The Pied Chat. Only twice seen	Oct. 18	....
644. RUTICILLA RUFIVENTRIS, The Indian Redstart. Very common	Sept. 19	Apr. 15
693. PETROPHILA CYANUS, The Western Blue Rock-Thrush. Fairly common.	Nov. 9	Mar. 23
761. CARPODACUS ERYTHRINUS, The Common Rose-Finch. Fairly common particularly in March and April	Oct. 14	Apr. 14
793. EMBERIZA STEWARTI, The White-Capped Bunting. Quite common in January in open grassy jungle .. ..	....	....
804. CHELIDON URBICA, The Martin. Only one pair seen .. ..	....	May 13
808. COTILE RIPARIA, The European Sand-Martin. Common in winter about marshes and tanks .. ..	....	Mar. 1
813. HIRUNDO RUSTICA, The European Swallow. Fairly common up till the end of April, an adult seen on May 22nd	Oct. 7	May 22
829. MOTACILLA PERSONATA, The Masked Wagtail. Abundant	Sept. 26	Apr. 1
832. MOTACILLA MELANOPE, The Grey Wagtail. Abundant	Sept. 20	Apr. 28
844. ANTHUS SIMILIS, The Brown Rock-Pipit. Fairly common all winter	Oct. 24	....

NOTES ON THE BIRDS OF SEHORE, CENTRAL INDIA. 161

	Date of Arrival.	Date of Departure.
1003. IYNX TORQUILLA, The Common Wry-neck. Rather scarce	Oct. 17	Mar. 26
1028. MEROPS PERSICUS, The Blue-Cheeked Bee-eater. Occurred in huge flocks from the 7th to the end of October 1909 in company with <i>M. philippinus</i> about Bhopal Jheel	Oct. 7	....
1066. UPUPA EPOPS, The European Hoopoe. Common in winter .. .. .	....	Apr. 7
1104. CUCULUS CANORUS, The European Cuckoo. Fairly common in summer	May 18	July 31
1265. TINNUNCULUS ALAUDARIUS, The Kestrel. Very common	Sept. 24	Apr. 1
1305. TURTUR FERRAGO, The Indian Turtle-Dove. Scarce up till March, but very common all March and up to 20th April.	Nov. 7	Apr. 20
1446. ÆGIALITIS ALEXANDRINA, The Kentish Plover. Fairly common—2 pairs observed in breeding plumage on May 1st	Sept. 19	May 1
1460. TOTANUS HYPOLEUCUS, The Common Sandpiper. Common	Sept. 3	May 2
1606. NYROCA FERRUGINEA, The White-eyed Duck. Common up till May and there were still four on the Bhopal lake on June 5th	Oct. 15	June 5

III.—PARTIAL MIGRANTS.

508. CAMPOPHAGA SYKESI, The Black-headed Cuckoo-Shrike. A monsoon visitor, very common in the jungle where it nests	June 14	....
518. ORIOLUS KUNDUO, The Indian Oriole. Very common in summer, the majority leave early in October. A very few stay the winter	Mar. 1	Oct. 10
555. STURNOPASTOR CONTRA, The Pied Myna. Common in winter about jheels and up till mid-May	Oct. 23	May 19
568. CYORNIS SUPERCILLIARIS, The White-browed blue Flycatcher. Only seen in March .. .. .	....	Mar. 20
579. STOPAROLA MELANOPS, The Verditer Flycatcher. Rather scarce	Nov. 10	Mar. 20
588. ALSEONAX LATIROSTRIS, The Brown Flycatcher. Common in the jungle, nests freely. Its habit of constantly depressing its tail makes		

	Date of Arrival.	Date of Departure.
recognition easy in spite of nondescript colour, probably stays much later	Apr. 15	Aug. 8
592. CULICICAPA CEYLONENSIS, The Grey-head- ed Flycatcher. Abundant	Nov. 12	Mar. 11
598. TERPSIPHONE PARADISI, The Indian Para- dise Flycatcher. A fairly common summer visitor especially along wooded streams	Apr. 15	Oct. 5
775. GYMNOTRIS FLAVICOLLIS, The Yellow- throated Sparrow. Abundant up till June. Nests in March, April and May. <i>Entirely</i> disappear in the rains	Oct. 20	June 16
869. MIRAFRA CANTILLANS, The Singing Bush- lark. Common in winter but vanishes in the rains.	Oct. 10	May 30
877. AMMOMANES PHOENICURA, The Rufous-tail- ed Finch-Lark. Abundant till June. Nests in crevices in the black cotton soil in March, April and May. None seen in the rains.. .. .	Sept. 26	June 16
879. PYRRHULAUDA GRISEA, The Ashy-crown- ed Finch-Lark. Another very common lark till the rains but a very few stay on through July. Nests in April and again in September	Aug. 12	June 14
1026. MEROPS VIRIDIS, The Common Indian Bee-eater. Abundant, except in the rains, and then it is only found in small parties in the jungle and along wooded nullahs	Sept. 20	June 16
1027. MEROPS PHILIPPINUS, The Blue-tailed Bee-eater. Occured in great flocks over the Bhopal jheel in company with <i>M. persicus</i> in Octo- ber 1909	Oct. 7	Nov. 21
1109. HIEROCOCYX VARIUS, The C o m m o n Hawk-cuckoo. A common monsoon visitor ..	June 20	Oct. 21
1118. COCCYSTES JACOBINUS, The Pied Crested Cuckoo. Abundant during the monsoon	June 5	Oct. 13
1120. EUDYNAMIS HONORATA, The Indian Koel. Only too common up till October. One also noted on December 2nd, another on February 19th ..	Mar. 24	Oct. 14
1321. PTEROCLURUS EXUSTUS, The C o m m o n Sand-grouse. Abundant till June. Nests in March, April and May	Oct. 4	July 2
1402. GALLINULA CHLOROPUS, The Moorhen, common	Nov. 6	Apr. 21

	Date of Arrival.	Date of Departure.
1405. <i>FULICA ATRA</i> , The Coot. Abundant till the rains. There were still 30 on July 3rd, only 4 on 10th July and 2 on 31st	Oct. 24	July 31
1422. <i>CUSORIUS COROMANDELICUS</i> , The Indian Courser. The same as 1405, but none seen after July 16th	Oct. 5	July 16
1425. <i>GLAREOLA ORIENTALIS</i> , The large Indian Pratincole. Common around the Bhopal Lake. Probably arrives much earlier and departs later.	May 1	July 24
1451. <i>HIMANTOPUS CANDIDUS</i> , The Black-winged Stilt. Abundant up till July	Sept. 26	July 3
1523. <i>PELECANUS PHILIPPENSIS</i> , The Spotted-billed Pelican. Common on the Bhopal Lake between these dates	June 23	July 24
1528. <i>PHALACROCORAX JAVANICUS</i> , The Little Cormorant. Abundant till July in which month it gradually disappears	Oct. 25	July 31
1529. <i>PLOTUS MELANOGASTER</i> , The Darter. Common till the break of the monsoon	Oct. 7	June 23
1541. <i>IBIS MELANOCEPHALA</i> , The Sacred Ibis. Same as 1529	Oct. 25	June 6
1544. <i>PLEGADIS FALCINELLUS</i> , The Glossy Ibis. Same as 1529	Oct. 25	June 6
1549. <i>XENORHYNCHUS ASIATICUS</i> , The Black-necked Stork. Common on the Bhopal Jheel	Jan. 20	July 31
1584. <i>SARCIDIORNIS MELANONOTUS</i> , The Comb Duck. Common	Nov. 10	July 10
1591. <i>NETTOPUS COROMANDELIANUS</i> , The Cotton Teal. Very common in places	Nov. 28	July 31

IV.—RESIDENTS.

4. *CORVUS MACRORHYNCHUS*, The Jungle Crow. Abundant. Winter visitor only to plains of N.-W. F. P.

7. *CORVUS SPLENDENS*, The Indian House-Crow. Abundant.

16. *DENDROCITTA RUFA*, The Indian Tree-pie. Common especially in jungle.

31. *PARUS ATRICEPS*, The Indian Grey Tit. Common in the jungle, not seen outside.

43. *MACHLOLOPUS HAPLONOTUS*, The Southern Yellow Tit. Common wherever trees.

105. *ARGYA CAUDATA*, The Common Babbler. }
 107. *ARGYA MALCOLMI*, The large Grey Babbler. } Common in scrub.

110. *CRATEROPUS CANORUS*, The Jungle Babbler. Common everywhere, especially in gardens.

135. *DUMETIA HYPERYTHRA*, The Rufous-bellied Babbler. Fairly common.

139. *PYCTORHIS SINENSIS*, The Yellow-eyed Babbler. Fairly common.

226. *ZOSTEROPS PALPEBROSA*, The Indian White-eye. Abundant.

243. *ÆGITHINA TIPHIA*, The Common Iora. Abundant wherever trees.

278. *MOLPASTES HÆMOREHOUS*, The Madras Red-vented Bulbul. Abundant everywhere.

327. *DICRURUS ATER*, The Black Drongo. Abundant. Summer visitor only to N.-W. F. P.

328. *DICRURUS LONGICAUDATUS*, The Indian Ashy Drongo. Common especially in jungle.

330. *DICRURUS CÆRULESCENS*, The White-bellied Drongo. Fairly common in some parts of the jungle and twice seen in gardens.

340. *DISSEMURUS PARADISEUS*, The Large Racket-tailed Drongo. Not observed personally, but occurs in the jungle.

374. *ORTHOTOMUS SUTORIUS*, The Indian Tailor-bird. Abundant, one of the few birds that regularly eat butterflies and moths.

381. *CISTICOLA CURSITANS*, The Rufous Fantail-Warbler. Common in grass and reed beds.

382. *FRANKLINIA GRACILIS*, Franklin's Wren-Warbler. Abundant everywhere.

384. *FRANKLINIA BUCHANANI*, The Rufous-fronted Wren-Warbler. Common in scrub jungle.

464. *PRINIA SOCIALIS*, The Ashy Wren-Warbler. Abundant especially in gardens.

465. *PRINIA SYLVATICA*, The Jungle Wren-Warbler. Common in thick scrub and jungle.

466. *PRINIA INORNATA*, The Indian Wren-Warbler. Fairly common in grass and scrub.

469. *LANIUS LAHTORA*, The Indian Grey Shrike. Common in scrub and cultivation.

473. *LANIUS VITTATUS*, The Bay-backed Shrike. Common everywhere.

476. *LANIUS ERYTHRONOTUS*, The Rufous-backed Shrike. Common everywhere.

488. *TEPHRODORNIS PONDICERIANUS*, The Common Wood-Shrike. Common especially in jungle. Oates (see O. & B.) says that birds of this genus don't take insects on the wing or on the ground. I have seen them do both and not infrequently.

500. *PERICROCOTUS PEREGRINUS*, The small Minivet. Very common.

501. *PERICROCOTUS ERYTHROPYGIUS*, The White-bellied Minivet. Not uncommon in scrub.

510. *GRAUCALUS MACII*, The Large Cuckoo-Shrike. Scarce.
544. *TEMENUCHUS PAGODARUM*, The Black-headed Myna. Abundant.
549. *ACRIDOTHERES TRISTIS*, The Common Myna. Abundant.
576. *CYORNIS TICKELLI*, Tickell's Blue Flycatcher. Fairly common along wooded streams.
604. *RHIPIDURA ALBIFRONTATA*, The White-browed Fantail Flycatcher. Abundant everywhere.
608. *PRATINCOLA CAPRATA*, The Common Pied Bush Chat. Fairly common especially along telegraph lines. Summer visitor only to N.-W. F. P.
629. *CERCOMELA FUSCA*, The Brown Rock-Chat. Common. 1 pair hatched out 3 broods consecutively in a ditch within 3 inches of a punkhah rope which was being constantly pulled.
661. *THAMNOBIA CAMBAIENSIS*, The Brown-backed Indian Robin. Abundant everywhere.
663. *COPSYCHUS SAULARIS*, The Magpie-Robin. Abundant.
720. *PLOCEUS BAYA*, The Baya weaver bird. Common; does not assume summer plumage till July, presumably owing to its late breeding season.
734. *UROLONCHA MALABARICA*, The White-throated Munia. Abundant.
735. *UROLONCHA PUNCTULATA*, The Spotted Munia. Scarce.
737. *STICTOSPIZA FORMOSA*, The Green Munia. Common in jungle.
738. *SPOREGINTHUS AMANDAYA*, The Indian Red Munia, fairly common in grass and scrub.
776. *PASSER DOMESTICUS*, The House-Sparrow. The usual pest.
803. *MELOPHUS MELANICTERUS*, The Crested Bunting. Common especially in scrub-jungle and about rocky hills.
809. *COTILE SINENSIS*, The Indian Sand-Martin. Not very common.
811. *PTYONOPROGNE CONCOLOR*, The Dusky Crag-Martin. Common.
818. *HIRUNDO SMITHII*, The Wire-tailed swallow. Abundant.
819. *HIRUNDO FLUVICOLA*, The Indian Cliff-swallow. Abundant. Breeds almost all the year round.
823. *HIRUNDO ERYTHROPYGIA*, Syke's Striated Swallow. Common among the rocky hills of Bhopal and in the city.
831. *MOTACILLA MADERAPATENSIS*, The Large-Pied Wagtail. Abundant.
847. *ANTHUS RUFULUS*, The Indian Pipit. Common in grass and in open scrub. This and next species are only Summer visitors to N.-W. F. P.
861. *ALAUDA GULGULA*, The Indian Sky-Lark. Fairly common.
871. *MIRAFRA ERYTHROPTERA*, The Red-winged Bush-Lark. Abundant in grass, scrub and open jungle. Still nesting in September.
875. *GALERITA DEVA*, Syke's Crested Lark. Common.
895. *ARACHNECHTHRA ASIATICA*, The Purple Sun-bird. Abundant, becomes scarce in July and August. Summer visitor only to N.-W. F. P.

921. *PIPRISOMA SQUALIDUM*, The Thick-billed Flower-pecker. Fairly common.

972. *LIOPICUS MAHRATTENSIS*, The Yellow-fronted Pied Woodpecker. Common.

976. *LYNGIPICUS HARDWICKII*, The Indian Pigmy Woodpecker. Scarce.

986. *BRACHYPTERNUS AURANTIUS*, The Golden-backed Woodpecker. Abundant.

991. *CHRYSOCOLAPTES FESTIVUS*, The Black-backed Woodpecker. Occurs in the jungle but is rare.

1019. *XANTHOLAEMA HAEMATOCEPHALA*, The Copper-smith. Abundant.

1022. *CORACIAS INDICA*, The Indian Roller. Common.

1033. *CERYLE VARIA*, The Indian Pied Kingfisher. Common.

1035. *ALCEDO ISPIDA*, The Common Kingfisher. Common.

1043. *PELARGOPSIS GURIAL*, The Stork-billed Kingfisher. Fairly common. A very close sitter.

1044. *HALCYON SMYRNENSIS*, The White-breasted Kingfisher. Abundant.

1062. *LOPHOCEROS BIROSTRIS*, The Grey Hornbill. Common.

1067. *UPUPA INDICA*, The Indian Hoopoe. Common.

1073. *CYPSELUS AFFINIS*, The Indian House Swift. Common.

1086. *MACROPTERYX CORONATA*, The Indian Crested Swift. Fairly common in the jungle.

1089. *CAPRIMULGUS MAHRATTENSIS*, Syke's Nightjar. Rather scarce.

1090. *CAPRIMULGUS MONTICOLA*, Franklin's Nightjar. Common in scrub and jungle, easily distinguished from other species by its note *pchee*, though this was only heard from mid-April till June.

1091. *CAPRIMULGUS ASIATICUS*, The Indian Nightjar. Common.

1095. *CAPRIMULGUS INDICUS*, The Jungle Nightjar. Fairly common in jungle. Its curious cry *cuckoo* (the u pronounced like the u in luck) is very distinctive, it is used by both sexes. I have only heard it in the breeding season.

1129. *TACCOCUA LESCHENAULTI*, The Sirkeer Cuckoo. Fairly common in grassy jungle.

1130. *CENTROPUS SINENSIS*, The Crow-Pheasant. Abundant.

1135. *PALÆORNIS NEPALENSIS*, The Large Paroquet. Fairly common.

1138. *PALÆORNIS TORQUATUS*, The Rose-ringed Paroquet. Only too common.

1139. *PALÆORNIS CYANOCEPHALUS*, The Western Blossom-headed Paroquet. Common.

1161. *SYRNIUM OCELLATUM*, The Mottled Wood-Owl. Common. Call—a drawn out "oo-waa" very distinct, answer *cook*.

1164. *KETUPA ZEYLONENSIS*, The Brown Fish-Owl. Common.

1168. *BUBO BENGALENSIS*, The Brown Rock Owl. Common.

1178. *SCOPS BAKKAMENA*, The Collared Scops Owl. I am not *absolutely* certain as to the species of Scops. This one emerges from a thick tree at dusk—and utters a cry very like the half bark, half howl of a terrier in an exciting dream—the sound resembles “*beo*”

1180. *ATHENE BRAMA*, The Spotted Owlet. Abundant.

1187. *NINOX SCUTULATA*, The Brown Hawk-Owl. Apparently scarce.

1191. *OTOGYPS CALVUS*, The King Vulture. Very common.

1192. *GYPS FULVUS*, The Griffon Vulture. Not common.

1194. *GYPS INDICUS*, The Indian Long-billed Vulture. Not common.

1196. *PSEUDOGYPS BENGALENSIS*, The Indian White-backed Vulture. Very common.

1197. *NEOPHRON GINGINIANUS*, The Smaller White Scavenger Vulture. Very common.

1203. *AQUILA VINDHIANA*, The Tawny Eagle. Fairly common.

1205. *AQUILA MACULATA*, The Spotted Eagle. Not uncommon about jheels.

1211. *SPIZAETUS CIRRHATUS*, The Crested Hawk-Eagle. Occurs in the jungle.

1216. *CIRCAETUS GALLICUS*, The Short-toed Eagle. Fairly common.

1220. *BUTASTUR TEESA*, The White-eyed Buzzard-Eagle. Our commonest bird of prey.

1226. *POLIOAETUS ICHTHYAETUS*, The Large Grey-headed Fishing Eagle. Occur occasionally on the Bhopal jheel.

1228. *HALIASTUR INDICUS*, The Brahminy Kite. Rather scarce.

1229. *MILVUS GOVINDA*, The Pariah Kite. Abundant.

1230. *MILVUS MELANOTIS*, The Large Indian Kite. Fairly common.

1232. *ELANUS CÆRULEUS*, The Black-winged Kite. Not uncommon in scrub and jungle.

1244. *ASTUR BADIUS*, The Shikra. Abundant.

1249. *PERNIS CRISTATUS*, The Crested Honey-Buzzard. Fairly common. Found a nest on a bare leafless tree (see O. and B.).

1257. *FALCO JUGGER*, The Laggar Falcon. Not common.

1264. *ÆSALON CHICQUERA*, The Turumti Merlin. Fairly common.

1272. *CROCOPUS CHLOROGASTER*, The Southern Green Pigeon. Common especially in the jungle. The Green Pigeon is supposed by Hume (see O. and B.) never to drink—as I was passing a jungle pool on 27th May last a *C. chlorogaster* flew up from it, 5 minutes later another flew down and drank. On my approach next day one again flew up and three minutes later 2 flew down and drank simultaneously. This was 6 p.m. (both days), so if they have a regular drinking hour it is probably earlier, as no others were seen later.

1292. *COLUMBA INTERMEDIA*, The Indian Blue Rock-Pigeon. Common.

1307. *TURTUR SURATENSIS*, The Spotted Dove. Abundant.

1309. *TURTUR CAMBAYENSIS*, The Little Brown Dove. Abundant.
1310. *TURTUR RISORIUS*, The Indian Ring-Dove. Abundant.
1311. *CENOPELIA TRANQUEBARICA*, The Red Turtle-Dove. Common especially in the jungle, except during the rains when it becomes scarce. Summer visitor only to N.-W. F. P.
1317. *PTEROCLES FASCIATUS*, The Painted Sand-Grouse. In dry weather keeps to the jungle and thick scrub but in the rains (June to October) moves into open scrub on high ground and seems to keep more in flocks then. Drinking hours appear to be twilight morning and evening. Nests in February and March.
1324. *PAVO CRISTATUS*, The Peacock. Abundant.
1350. *GALLOPERDIX LUNULATA*, The Painted Spur-fowl. Fairly common in jungle.
1356. *COTURNIX COROMANDELICA*, The Rain Quail. Common.
1357. *PERDICULA ASIATICA*, The Jungle Bush-Quail. Abundant. Put up a family just fledged on January 16th.
1358. *PERDICULA ARGUNDA*, The Rock Bush-Quail. Not nearly so common as the last.
1373. *FRANCOLINUS PICTUS*, The Painted Partridge. Common nests in April, May and June.
1375. *FRANCOLINUS PONDICERIANUS*, The Grey Partridge. Common, nests from February to the end of April.
1382. *TURNIX PUGNAX*, The Bustard-Quail. Not common.
1400. *AMAUROENIS AKOOL*, The Brown Crake. Common.
1401. *AMAUROENIS PHENICURUS*, The White-breasted Water-hen. Common. Nests in May and June. Breeding cry Kawak (repeated) very loud and uttered from thick cover.
1409. *GRUS ANTIGONE*, The Sarus. Abundant. 2 nests with eggs found on 28th December (see O. and B.). One of the parents was sitting and on being approached became very excited and danced about in front and over its nest.
1416. *SYPHEOTIS AURITA*, The Lesser Florican. Scarce.
1418. *EDICNEMUS SCOLOPAX*, The Norfolk Plover. Common in open jungle and fairly so in scrub. Very noisy after dusk and before dawn.
1429. *HYDROPHASIANUS CHIRURGUS*, The Pheasant-tailed Jacana. Abundant.
1431. *SARCOGRAMMUS INDICUS*, The Red-wattled Plover. Abundant.
1433. *SARCIOPHORUS MALABARICUS*, The Yellow-wattled Plover. Fairly common in thick scrub.
1447. *ÆGIALITIS DUBIA*, The Little Ringed Plover. Fairly common.
1488. *ROSTRATULA CAPENSIS*, The Painted Snipe. Not very common.
1503. *STERNA SEENA*, The Indian River-Tern. Common.
1504. *STERNA MELANOGASTER*, The Black-bellied Tern. Fairly common.

1545. *PLATALEA LEUCORODIA*, The Spoonbill. Common.
1548. *DISSURA EPISCOPUS*, The White-necked Stork. Fairly common in jungle.
1552. *PSEUDOTANTALUS LEUCOCEPHALUS*, The Painted Stork. Common.
1554. *ARDEA MANILLENSIS*, The Eastern Purple Heron. Common in reed beds and jheels.
1555. *ARDEA CINEREA*, The Common Heron. Common.
1559. *HERODIAS ALBA*, The Large Egret. Rather scarce.
1560. *HERODIAS INTERMEDIA*, The Smaller Egret. Abundant.
1561. *HERODIAS GARZETTA*, The Little Egret. Abundant.
1562. *BUBULCUS COROMANDUS*, The Cattle Egret. Scarce.
1565. *ARDEOLA GRAYI*, The Pond Heron. Very abundant.
1567. *BUTORIDES JAVANICA*, The Little Green Heron. Rather scarce but occurs along wooded streams.
1568. *NYCTICORAX GRISEUS*, The Night Heron. Not very common.
1589. *DENDROCYCNA JAVANICA*, The Common Whistling Teal. Common, saw a young one not fully fledged on December 5th.
1593. *ANAS PECTILORHYNCHA*, The Spot-billed Duck. Abundant, a duck followed by 9 tiny ducklings seen on November 28th.
1617. *PODICIPES ALBIPENNIS*, The Indian Little Grebe. Abundant, occurs in big flocks on the Bhopal Lake.

V.—DOUBTFUL WHETHER MIGRANTS OR NOT.

40. *SYLVIPARUS MODESTUS*, The Yellow-browed Tit. Shot one on 17th October 1909, the only one seen but from its close resemblance to a Flower Pecker (*P. squalidum*) it may have been overlooked, confirms Jerdon's record (see O. and B.)
389. *MEGALURUS PALUSTRIS*, The Striated Marsh-Warbler. Flushed several in reed beds and marshes in September and one in November (shot 1 and sent it to the B. M.)
551. *ACRIDOTHERES GINGINIANUS*, The Grey Bank Myna. Not common, only seen in winter.
601. *HYPOTHYMIS AZUREA*, The Black-naped Flycatcher. Only met with in April in high jungle.
607. *RHIPIDURA PECTORALIS*, The White-spotted Fantail Flycatcher. Scarce. Not observed at all between mid-October and mid-February.
1383. *TURNIX DUSSUMIERI*, The Little Button-Quail. Not common. Only met with in December and January.
1404. *PORPHYRIO POLIOCEPHALUS*, The Purple Moorhen. Scarce, only noted between September and February.
1428. *METOPIDIUS INDICUS*, The Bronze-winged Jacana. Common from early October to May, but only once seen after May 3rd and that was on June 22nd.

1510. STERNA MINUTA, The Little Tern. Only seen in June, it was then in breeding plumage.

1517. RHYNCHOPS ALBICOLLIS, The Scissor-bill. Only seen in July.

1526. PHALACROCORAX CARBO, The Large Cormorant. Scarce, probably resident but not noticed from 10th July till October.

1542. INOCOTIS PAPILLOSUS, The Black Ibis. Only met with by a jungle stream in May.

1575. PHOENICOPTERUS ROSEUS, The Common Flamingo. Only seen in July.



R. K. Bhide del.

J. Green, Chromo

HABENARIA SUSANNÆ, Br.

ORCHIDS OF THE BOMBAY PRESIDENCY.

The description of Plate XI—*Habenaria susannæ*—will appear in the next number.

EDS.

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XII.

(With Plate XI).

(Continued from page 602 of Volume XX.)

We now finally arrive at the species comprised in Tribe IV, *Ophrydeæ*, of which the general characters were given on p. 433 (Vol. XVI).

In the Flora of British India all the Bombay plants comprised in this Tribe have been aggregated under the generic title of *Habenaria*. Dr. T. Cooke, in his recently published *Flora of Bombay*, has, however, subdivided them into three genera, and as his work will probably be the text book for many years to come, it may be most expedient for us to follow his example.

The characters of his three genera are shortly, terrestrial, tuberous herbs, *leaves* membranous or fleshy.

* *Sepals* subequal and more or less connivent; *petals* equal to or shorter than the *sepals*..... 29. *Peristylus*.

** *Sepals* unequal, the *lateral* more or less spreading. *Stigmas* sessile or subsessile, confluent or more or less distinct..... 30. *Platanthera*.

Stigmas more or less distinctly stalked, very rarely confluent 31. *Habenaria*.

29. *Peristylus*.

Terrestrial. *Flowers* in *spikes* terminating the leafy stems, *sepals* and *petals* subequal, often connivent, *lip* continuous with the *column*, produced at the base into a short *spur*, *column* short; *anther cells* parallel; apex inferior, short and adnate to the base of the *column*; *pollinia* granular with short caudicles and exserted naked *glands*; *staminodes* lateral, auriculate; *stigma* sessile; *rostellum* serrulate or tooth-like, situated between the *anther cells*.

- * *Spur* as long as or longer than the sepals,
subclavate 1. *P. Stocksii*.
- ** *Spur* shorter than the sepals, globose or
ellipsoid.
- a. *Stem* leafy, the leaves scattered or
subimbricate..... 2. *P. spiralis*.
- b. *Leaves* clustered about the middle of
the stem. *Lip* shorter than the
sepals, *petals* white 3. *P. plantagineus*.
Flowers yellowish-green, *spikes* dense,
long. *Lip* as long as *sepals*, *lateral*
sepals mucronate behind below apex 4. *P. goodyeroides*.
var. *affinis*.
- Flowers* yellow, *spikes* lax, short, *lip*
as long as *sepals*, *lateral sepals* not
mucronate below apex 5. *P. Lawii*.

1. PERISTYLUS STOCKSII, *Kranzlin*; *T. Cooke, Fl. of Bombay, II, p. 710*; *Habenaria Stocksii, Hook. f. Fl. Br. Ind., VI, p. 158*.

Whole plant 6 to 18 inches high, *stems* slender, with numerous sheaths on the lower part; *leaves* more or less clustered towards the middle of the stem, variable, 3 to 6 inches long by $\frac{1}{2}$ to $1\frac{1}{2}$ inches broad, obovate or elliptic or lanceolate obtuse, acute or acuminate, usually petioled. *Spikes* twisted, 3 to 6 inches long, *flowers* yellowish, secund, $\frac{1}{6}$ inch in diameter, *bracts* longer than the *ovaries*, ovate acuminate, $\frac{1}{5}$ to $\frac{5}{8}$ inch long, *sepals* 1-nerved, *dorsal* elliptic oblong obtuse, *lateral* linear—oblong, at length reflexed, *petals* larger, ovate, obtuse, fleshy, *lip* shorter than the sepals, obtusely 3-fid; *claw* broad, concave, *lateral lobes* a little shorter and narrower than the midlobe, slightly incurved, *midlobe* oblong obtuse, *spur* shorter than the ovary, *pollinia* clavate, *stigmatic lobes* clavate, *rostellum* minute, erect 2-fid.

Flowers appear during July and August.

Distribution.—Throughout the Konkan, North Kanara and hills of the Western Peninsula generally.

2. PERISTYLUS SPIRALIS, *A. Rich.*; *T. Cooke, Fl. of Bombay, II, p. 711*; *Habenaria torta, Hook. f., Fl. Br. Ind., VI, p. 159*.

Whole plant 6 to 18 inches high, *stem* slender, leafy, often

flexuous; *leaves* 1 to $2\frac{1}{2}$ inches long by $\frac{1}{4}$ to $\frac{3}{8}$ inch broad, linear-lanceolate, obtuse, acute or acuminate, coriaceous, sheathing at the base, the *upper* passing into numerous, lanceolate sheaths. *Spikes* 2 to 10 inches long, lax-flowered, twisted, *flowers* greenish white, secund, $\frac{1}{3}$ inch in diameter, *bracts* $\frac{1}{4}$ inch long, lanceolate, finely acuminate, equalling or the lower exceeding the ovary, *dorsal sepal* linear oblong obtuse, concave, *lateral* linear obtuse, falcate, *petals* linear—oblong obtuse, *lip* equalling the sepals, variable, fleshy, rather longer than broad, *claw* short, broad, concave, *blade* 3-cleft beyond the middle, *side lobes* narrower than the midlobe, linear acute, *midlobe* linear, obtuse, *spur* small, globose, *anthers* minute, the *cells* parallel, *tubes*. *Pollinia* pyriform, *caudicle* short, *glands* oblong, *stigmatic processes* short, clavate, *rostellum* 3-fid.

Flowers appear in July and August.

Distribution.—Throughout the Konkan, Western Ghats and North Kanara and Hills of the Western Peninsula, Ceylon.

3. PERISTYLUS PLANTAGINEUS, *Lindl. Gen. & Sp. Orchid.*, p. 300; *T. Cooke, Fl. of Bombay, II*, p. 711; *P. elatus, Dalz. & Gibs.*, p. 270; *Habenaria Wightii, Trimen, Fl. Br. Ind.*, VI, p. 162.

Plant about 2 feet high, bituberculate, *stem* robust, lower part with loose *sheaths*; *leaves* about the middle of the stem, 5 to 7 inches long by 2 to 3 inches broad, oblong-lanceolate acuminate, strongly nerved beneath, closely sheathing at the base. *Spikes* 4 to 8 inches long, lower part clothed with lanceolate sheaths, *bracts* $\frac{1}{2}$ inch long, sheathing, acute, almost reaching to the tips of the *flowers*, which are very small, $\frac{1}{2}$ inch in diameter and densely crowded, greenish white, *dorsal sepal* ovate obtuse, 1-nerved, *lateral* narrower, *petals* obliquely orbicular, 3-nerved, *lip* white, almost fiddle-shaped, *lateral lobes* narrow, with small projecting teeth, *midlobe* rounded, *spur* small, globular, *pollinia* pear-shaped, very granular, *caudicle* very short, *gland* small.

Flowers in August.

Distribution.—Konkan and North Kanara, Western Peninsula and Ceylon.

4. PERISTYLUS GOODYEROIDES, *Lindl. var. affinis, Lindl.*, *T. Cooke, Fl. of Bombay, II*, p. 712; *Dalz. & Gibs. p. 270*; *Habenaria goodyeroides, Grah.*; *Fl. Br. Ind.*, VI, p. 161.

Stem 1 to 2 feet high, stout. *Leaves* collected about the middle

of the stem, 6 to 10 inches long by 2 to $2\frac{1}{2}$ inches broad, elliptic lanceolate acute, almost sessile. *Spikes* dense, 4 inches to a foot long. *Flowers* yellowish-green, *bracts* membranous, lanceolate, acuminate, from $\frac{1}{2}$ to $\frac{3}{4}$ inch long, becoming as short as the sessile *ovary* upwards, *lateral sepals* $\frac{1}{2}$ by $\frac{1}{12}$ inch, oblong obtuse, mucronate behind below the apex, *dorsal sepal* $\frac{1}{2}$ by $\frac{1}{10}$ inch, elliptic oblong, obtuse, not mucronate, *petals* as long as but slightly broader than the sepals, obliquely obovate, strongly nerved, *lip* equalling the petals, sessile, usually 3-fid, the *lobes* very variable, *spur* subglobose, $\frac{1}{12}$ inch long, *anther* small, *tubes* very short, *pollinia* clavate, *rostellum* erect, toothed.

Flowers appear during July and August.

Distribution.—Konkan, North Kanara, E. Himalayas, Khasia and Naga Hills, Hills of the Western Peninsula.

5. PERISTYLUS LAWII, Wight; T. Cooke, *Fl. of Bombay*, II, p. 712; Dalz. & Gibs., p. 270; Habenaria Lawii, Hook. f. *Fl. Br. Ind.*, VI, p. 162.

Stem up to a foot in height, clothed with loose *sheaths* below the leaves which are in clusters of 3 to 5 towards the middle of the stem. These are $2\frac{1}{2}$ to 4 inches long by $\frac{3}{4}$ to $1\frac{1}{2}$ inch broad, membranous, oblong-lanceolate acute, not sheathing at the base. *Spikes* narrow, erect, lax, 2 to 3 inches long. *Flowers* yellow, *bracts* less than $\frac{1}{2}$ inch long, lanceolate acuminate, exceeding the *ovary*. *Sepals* all 1-nerved, *lateral* $\frac{1}{2}$ by $\frac{1}{16}$ inch, oblong obtuse, *dorsal* $\frac{1}{2}$ by $\frac{1}{10}$ inch, oblong obtuse, concave, *petals* similar, oblong obtuse, *lip* $\frac{1}{2}$ by $\frac{1}{10}$ inch, *claw* concave, *apex* shortly 3-lobed, *lobes* subequal, obtuse *spur* short, globular, *anther tubes* absent, *pollinia* clavate, *caudicle* absent, *glands* small, *stigmatic processes* very short, clavate, *rostellum* short, triangular, acute.

Flowers appear during July and August.

Distribution.—Konkan, Western Ghats, Southern Mahratta Country, Western Peninsula, Bengal.

FURTHER NOTES ON SOME MAMMALS FROM LOWER SIND.

BY

R. C. WROUGHTON.

As mentioned in an Editorial footnote to my paper *On A Small Collection of Rodents from Lower Sind* in the last number of the Journal some other specimens, besides those recorded, were included in Mr. Priestley's Collection. These unfortunately did not reach me in time to be published in the above paper but as there are several interesting specimens amongst them it has been thought worth while to publish the following list to which is also added some notes on hares obtained in adjacent districts:—

Erinaceus blanfordi, Anders.

♂ 18♀ 17.

The specimens have no parting on the crown and it is possible that after all *jerdoni* and *blanfordi* may prove to be separate species. To settle this question specimens like these from Rohri, the type locality of *blanfordi*, are *a sine qua non*.

(39). *Felis ornata*, Grey and Hardw.

1832. *Felis ornata*, Grey and Hardwicke. Ill. Ind. Zool. i., pl. 2.

♂ 41, 42, 43, 44, 48. ♀ 40, 49, 51.

A fine series, very constant in essential characters.

(60 part.) *Mungos ferrugineus*, Blanf.

1874. *Herpestes ferrugineus*, Blanford. P. Z. S., p. 661. pl. lxxxi.

♂ 55, 64. ♀ 56, 62.

These specimens are undoubtedly *ferrugineus*, Blanf., which was based on a specimen from Larkhana, Sind. The ochraceous colouring is much exaggerated in the plate accompanying Blanford's description. The synonymy of the Common Indian Mongoose, recorded as *Herpestes mungo* in Blanford's Mammalia, is very involved and obscure, but by whatever name it is known whether *mungo*, *nemo*, *griseus*, or *nyula*, &c., it is different from the Sind form, which shows quite constantly an ochraceous tint in its pale colouring and the ferrugineous tail tip which so markedly characterises it.

(58 part.) *Mungos pallipes*, Blyth.

1845. *Herpestes pallipes*, Blyth. J. A. S. B., xiv, p. 346.

♂ 53.

The type locality of *pallipes* is Kandahar. It is a pale form of *auropunctatus*, Hodg., from Nepal. On the material available I have no hesitation in separating the two, both being constant forms in their respective habitats. When our Mammal Survey is completed it may prove that the Sind form deserves no more than subspecific rank.

(72) *Vulpes bengalensis*, Shaw.

1800. *Canis bengalensis*, Shaw., Gen. Zool. i., p. 330.

♂ 45.

If *kokree*, Sykes, the Dekhan form is separable from true *bengalensis*, then geographically the present animal should be most closely allied to the former but the material available for comparison is so inadequate that I am not in a position to advance an opinion. A series of typical specimens from Bengal is a great desideratum.

(74) *Vulpes leucopus*, Blyth.

1854. *Vulpes leucopus*, Blyth. J. A. S. B., xxiii., p. 729.

♀ 46, 47.

Blyth gives no exact locality for his *leucopus* but speaks of it as "the small desert Fox of W. India." His description is therefore probably a generalised one. The present specimens do not agree with his description in several details, but nevertheless it does not seem possible that they could be anything else. His *pusillus* from the Salt Range is apparently a different animal with conspicuous black cheeks. Series of the several varieties of the Fox inhabiting N.-W. India are a great desideratum and until they are available it seems to me hopeless to try and unravel the tangle of Blyth's *leucopus*, *griffithi*, *pusillus*, &c.

(291) *Grypomys gleadowii*, Murr.

1885. *Mus gleadowii*, Murray. P. Z. S., p. 809.

3 ♀ ♀ in spirit (one presented to the National Collection).

The type locality is Karrachi. It has not been taken again anywhere since its description by Murray in 1885. Indeed the two original specimens and the present three are so far as I know the only ones to be found in any museum.

(321) *Lepus dayanus*, Blanford.

1874. *Lepus dayanus*, Blanford. P. Z. S., p. 663.

♂ 84. ♀ 81, 82, 83, 22.2.11. N. B. Kinnear, Thar and Parkar.

Lepus sp.

♂ 28. ♀ 27. S. H. Prater, Viramgaum.

Lepus sp.

♀ 2. N. B. Kinnear, Shamgarh.

Mr. Kinnear's four specimens from Thar and Parkar are, I believe, undoubtedly *dayanus*. A specimen from Rajputana in the Natural History Museum Collection obtained by Blanford is labelled in his own handwriting

"intermediate between *dayanus* and *ruficaudatus*. Mr. Prater's Viramgaum specimens seem very similar while Mr. Kinnear's Shamgarh specimen seems to resemble much more closely the type which represents to me true *ruficaudatus*. This last name was given by Geoffroy with but a few words of description to a specimen from 'Bengal.' Until a series of typical Bengal specimens is available with other series linking it geographically with *dayanus* it seems to me the riddle of the Indian Hares will remain a riddle.

SOME NOTES ON BIRDS FROM GYANTSE AND CHUMBI
IN TIBET, WITH A LIST OF THE GAME BIRDS
KILLED DURING THE FOUR YEARS, 1906-1909.

BY

CAPTAIN F. M. BAILEY.

Monal (*LOPHOPHORUS REFULGENS*). Tib.—“*Chadang*.”

The Monal is found in the Chumbi Valley up to the tree limit (about 14,000 feet); and I found a nest at Lingmotang at 10,000 ft. on the 15th May 1904. They have a habit of whistling in the early morning, and at this time it is easy to walk through the thick forest towards the sound and shoot them sitting. I found that the following was the best way to get sporting shots; two guns would walk quietly along the road and two men would go through the forest above, these men whistled if they saw any Monal and then put them up when they would fly downhill over our heads. I found that the average weights of birds shot in January were cocks 5 lb. and hens 4lb. 11 oz.

Blood Pheasant (*ITHAGENES CRUENTUS*). Tib.—“*Semo*.”

The Blood Pheasant is common in the Chumbi Valley. I have seen it from 10,000 feet up to the tree limit. It is not a sporting bird, as it seldom flies, and when it does the undergrowth is usually too thick for a shot. I found that the only way to kill the Blood Pheasant was to stalk through the thick forest, usually of rhododendron, which it frequents, and to shoot it on the ground.

I once saw a Tragopan, which had been killed in the Chumbi Valley, and once a Snow Partridge (*Lerwa lerwa*), but both these birds must be very scarce.

Tibetan Snow Cock (*TETRAOGALLUS TIBETANUS*). Tib.—“*Lhapcha Kongmo*” or simply “*Kongmo*.”

This bird is to be found in the Chumbi Valley above the tree limit. It is fairly plentiful at Phari and near Gyantse, and I have frequently taken nests during June and July at altitudes between 14,500 and 15,500 feet. The reason why only 13 were shot in the four years is that this bird lives up on the high hills

where Burhel or *Ovis ammon* are also to be found, and it was seldom worthwhile to disturb the larger game by firing at Snow Cock.

Tibetan Partridge (*PERDIX HODGSONIÆ*). Tib.—“*Rhakpa*.”

The Tibetan Partridge is common at Gyantse, and I have also seen it at Dotha and Kambu in the Chumbi Valley, just above tree level. I have taken nests near Gyantse in June, July and the beginning of August. Two good days? partridge shooting for two guns near Gyantse yielded 48 partridges and 25 hares (*Lepus oiostolus*) and 43 partridges and 34 hares respectively. I have seen them at various altitudes between 13,000 and 15,000 feet.

Tibetan Sandgrouse (*SYRHAPTES TIBETANUS*). Tib.—“*Ka ka ling ma*” or “*Ka ka li*.”

These birds may be seen in flocks of from 10 to 20 anywhere north of the Tangla from August to February, and I have once seen them in May. They appear to have no special hour for drinking, and are not at all shy, so it is possible to walk up to within gunshot distance when they are feeding on the bare plains. On being fired at the flock will fly only a hundred yards or so, and will allow another shot to be taken in the same manner. In this way a flock could easily be exterminated, as they do not seem to get any wilder. I have seen them at Kambajong and at various places in the Bramaputra Valley, west of Shigatse. I made every effort to get the eggs of this bird, but without success.

Himalayan Solitary Snipe (*GALLINAGO SOLITARIA*).

I have never been able to find a Tibetan name for a snipe, beyond the ordinary word “Chubja” which refers to duck and other water birds. One man told me that snipe were the young of cranes! The solitary snipe is only seen in winter between the months of September and February. I once shot one at Gyantse on 28th March, but this must have been a straggler. Occasionally they have been shot in the Chumbi Valley. They lie very close and may sometimes be seen sitting in the mud before they rise. Their flight is usually shorter than that of the Fantail or Pintail. I killed 12 in one day, in December, at Samoda, one of the stages on the road to Gyantse. The earliest bird

seen was on 31st August and the latest on 28th March. I have never seen the eggs or young birds.

The only other snipe that I have seen are Fantail and Pintail. Unfortunately no note was made of the numbers of each of these two varieties. They arrive at the beginning of August, in which month and in September they are found in the irrigation ditches between the fields at Gyantse. In August, September and October, they occur in large numbers on the marshes round Rham tso (14,700 ft.), the lake passed on the road to Gyantse. So far as I know they do not breed in that locality and I have never seen them in the Chumbi Valley. The earliest bird was shot on 3rd August 1909 and the latest on 28th October. I once shot a stray bird on 15th April.

The Eastern Golden Plover (*CHARADRIUS FULVUS*).

These birds were very plentiful on the marshes at Rham tso, and many more could have been shot; but they are not very sporting birds, and we usually let them off if snipe or duck were to be got. They arrive at the Gyantse with the Snipe, and are to be seen there in August and September. The first bird was shot on 11th August and the last on 29th October. I do not think that they breed there.

Four green plover (*Vanellus vulgaris*) were shot, two in October, one in March, and one on 1st April. A Whimbrel (*Numenius phaeopus*) was obtained at Rham tso on 3rd September 1908. Curlew were often seen on this marsh but were never shot. On 2nd May 1908, a Black-tailed Godwit (*Limosa belgica*) was killed at Gyantse. Redshanks (*Totanus calidris*) are common, and I have taken the eggs in May, June and July. Stilts (*Himantopus candidus*), Avocets (*Recurirostris avocetta*), Greenshanks (*Totanus canescens*) and many other waders, are seen on this marsh in August, September and October, after which months both the lake and the marsh freeze and the birds are obliged to leave. Gulls (*Larus bruneicephalus*) and Terns are common near the lake and are also seen at Gyantse. Two coots (*Fulca atra*) were obtained, one at the beginning of March and the other at the end of October, but these birds are scarce. From the list below it can be seen the species of duck which are found in this part of Tibet.

Bar-headed Goose (*ANSER INDICUS*).

A description of the nesting of the Bar-headed Goose appeared on p. 367 of Vol. XIX. The nests are found at Rham tso (14,700) at the beginning of June.

Brahminy Duck (*CASARCA RUTILA*): Tib.---“*Angba Serpo*.”

I have taken nests at Gyantse (13,100) and at Tuna (15,000) in May. The nest is found in a cliff, sometimes more than a mile from water.

The Ruddy Sheldrake is the only duck of which I have obtained eggs, but I have seen broods of young Mergansers (*M. castor*) on the river in summer at a height of about 14,000 feet.

LIST OF GAME SHOT AT GYANTSE AND IN THE CHUMBI VALLEY DURING THE YEARS 1906-1909.

Black-necked Crane (<i>Grus nigricollis</i>) (1) ..	..	..	17
Demoiselle Crane (<i>Anthropoides virgo</i>) (1) ..	..	..	3
Bar-headed Goose (<i>Anser indicus</i>) (1) ..	..	..	644
Ruddy Sheldrake (<i>Casarca rutila</i>) (1) ..	..	..	134
Common Sheldrake (<i>Tadorna cornuta</i>) (1) ..	..	..	1
Mallard (<i>Anas boscas</i>) ..	..	..	172
Pintail (<i>Dafila acuta</i>) ..	..	..	205
Gadwall (<i>Chaulelasmus streperus</i>) ..	..	..	185
Wigeon (<i>Mareca penelope</i>) ..	..	..	41
Common Pochard (<i>Nyroca ferina</i>) ..	..	..	26
White-eyed Pochard (<i>Nyroca africana</i>) ..	..	..	10
Tufted Pochard (<i>Fuligula fuligula</i>) ..	..	..	26
Red-crested Pochard (<i>Netta rufina</i>) ..	..	..	2
Shoveller (<i>Spatula clyptea</i>) ..	..	..	22
Common Teal (<i>Nettium crecca</i>) ..	..	..	140
Garganey Teal (<i>Querquedula ciria</i>) ..	..	..	256
Goosander (<i>Mergus castor</i>) ..	..	..	38
Himalayan Solitary Snipe (<i>Gallinago solitaria</i>) ..	..	..	70
Snipe (<i>Gallinago caelestis</i> & <i>stenura</i>) ..	..	..	287
Eastern Golden Plover (<i>Charadrius fulvus</i>) ..	..	..	150
Green Plover (<i>Vanellus vulgaris</i>) ..	..	..	4
Tibetan Partridge (<i>Perdix hodgsoniae</i>) ..	..	..	509
Tibetan Snow-Cock (<i>Tetraogallus tibetanus</i>) ..	..	..	13
Tibetan Sand-grouse (<i>Syrhaptes tibetanus</i>) (2) ..	..	..	118

(1) Killed only at Gyantse and north of the Tangla.

(2) Killed only in the Chumbi Valley.

Monal Pheasant (<i>Lophophorus refulgens</i>)	..	..	7
Pigeon (<i>Columba rupestris</i>) (1)	..	..	351
Snow Pigeon (<i>Columba leuconota</i>) (2)	..	..	8

The European Hoopoe (*UPUPA EPOPS*). Tib.—“*U-pu-pi-shu.*”

The Hoopoe is to be seen in this part of Tibet in summer only. The first bird I noticed one year appeared on 28th March. It nests at Gyantse (13,100) in June, in holes in walls and cliffs.

The Lammergeier (*GYPAËTUS BARBATUS*). Tib.—“*Cha ko.*”

On the 27th April 1908, in a cliff near Gyantse, at a height of 14,800 feet, a nest was found which contained one young bird; in the same nest there was a single egg on 17th February 1909.

The Himalayan Rough-legged Buzzard (*ARCHIBUTEO HEMIPTILOPUS*). Tib.—“*Cha Kyi.*”

A note and photograph of what I believed to be the nest of this bird was published in Vol. XIX, p. 523; but on comparing the eggs with those of *A. hemiptilopus*, I find that mine are much larger. The bird, which was identified in Bombay as *A. hemiptilopus*, was shot near the nest the day after the eggs were taken and I believed it to be the bird which I had seen in the nest. I must however have shot another bird, and my eggs consequently are unidentified.

The Black-eared Kite (*MILVUS MELANOTIS*). Tib.—“*Ping-gyu-ma.*”

Many nests were seen in May in the trees round the villages on the Gyantse plain (13,100), and one earlier nest on the 17th April. The nests always contained two eggs.

The Kestrel (*TINNUNCULUS ALAUDARIUS*).

I took one nest with four eggs in a cliff at Gyantse on the 23rd of May 1908.

The Osprey (*PANDION HALIAËTUS*).

Ospreys were seen at Gyantse every year in April and May, but did not nest there. I have also seen one in the Chumbi Valley.

(1) Killed only at Gyantse and north of the Tangle.

(2) Killed only in the Chumbi Valley.

Rufous Turtle-Dove (*TURTUR ORIENTALIS*). Tib.—“*Di-di-gu-gu.*”

Nests in small trees at Gyantse, in May and August. I have never taken eggs in June or July. This dove does not remain in the country during the winter.

The Blue Hill Pigeon (*COLUMBA RUPESTRIS*). Tib.—“*Angoa*” or “*Oron.*”

Nests at Gyantse (13,100) and at Kangmar (14,000), in ruined houses, from the end of April till the middle of July.

The Lesser Sand-Plover (*ÆGIALITIS MONGOLICA*).

I cannot be quite certain of the identification of this bird. The nest was taken on the Tangla (15,200) in June.

The Ibis-bill (*IBIDORHYNCHUS STRUTHERSI*).

Nests at Gyantse in May and June and also in the Chumbi Valley, between 10,000 and 14,000 feet (see note on p. 993 of Vol. XIX, Journ., Bom. Nat. Hist. Socy.).

The Black-necked Crane (*GRUS NIGRICOLLIS*). Tib.—“*Trung drung.*”

I have obtained these eggs from the marsh at Rham tso (14,700), at the beginning of June. The bird is common at Gyantse in winter.

The Demoiselle Crane (*ANTHROPOIDES VIRGO*). Tib.—“*Chahung.*”

This bird was twice shot at Gyantse on 13th October 1906 and 28th October 1908. It does not nest in this part of Tibet.

The Raven (*CORVUS CORAX*). Tib.—“*Oroa.*”

At Gyantse on the 15th February 1909, I found one nest containing six eggs in a niche of the wall of an inhabited house, about 15 feet from the ground. The structure was of sticks and about four feet high, the nests of successive years being piled one above the other. I also took a nest on the 12th March 1909. The bird is very common and is the chief scavenger.

The Chough (*PYRRHOCORAX GRACULUS*). Tib.—“*Kyung Ka.*”

Nests are common in May at Gyantse (13,100), and at Tuna (15,000), and once I took a nest containing fresh eggs on the

30th July. The Chough also nests in the Chumbi Valley in April; one nest was in the roof of the office which I was occupying daily.

The Black-rumped Magpie (*PICA BOTTANNENSIS*). Tib.—“*Kya-ga* or *Tra-ga*.”

This bird nests in trees at Gyantse in May. The nest is a very common and conspicuous object.

Wadell's Babax (*BARBAX WADELLI*).—“*Jomo*.”

Nests were to be seen in trees at Gyantse (13,100) at the end of April and in May.

Stoliczka's Willow-Tit (*LEPTOPŒCILE SOPHILÆ*).

The nest which usually contains five eggs is found in thorny bushes at Gyantse, at the end of April and at the beginning of May.

Tickell's Willow Warbler (*PHYLLOSCOPUS AFFINIS*).
Gyantse (13,100).

Nests in low bushes at the end of May and in June. The nest is placed very low and is often concealed by growing grass.

The Grey-backed Shrike (*LANIUS TEPHRONOTUS*). Tib.—“*Tré tré*.”

Nests were taken at Gyantse (13,100) and at Kangmar (14,000), at the end of June and in July. The nest is placed in a tree or bush.

Gould's Chat (*SAXICOLA MONTANA*).

Nests in holes in banks, near Gyantse (13,100), at the end of May.

The White-capped Redstart (*CHIMARRHORNIS LEUCOCEPHALUS*).

Common in the Chumbi Valley, where I have taken nests at 11,000 feet in June.

The Indian Redstart (*RUICILLA RUFIVENTRIS*).

One nest containing four eggs was taken at Rham tso (14,700), in a hole in a wall, on 2nd June 1908.

The Plumbeous Redstart (*RHYACORNIS FULIGINOSUS*).

One nest at Chumbi (9,800), on 10th July 1908. The nest was in an overhanging bank.

The Robin Accentor (*ACCENTOR RUBECULOIDES*).

One nest was taken at Dochen, at a height of 15,500, on 2nd July 1908. The bird is common at Gyantse. (See p. 222, Vol. XX.)

The Rufous-breasted Accentor (*ACCENTOR STROPHIATUS*).

One nest was found in a low bush at Kangmar (14,000), on 27th June 1906.

The Beautiful Rose-Finch (*PROPASSERS PULCHERRIMUS*). Tib.---“*A-u-luk-se*.”

At Gyantse (13,100) and at Kangmar (14,000) the nests were common in July and August.

Severtzoff's Rose-Finch (*CARPODACUS SEVERTZOWI*).

Nidification similar to *P. pulcherrimus*.

Walton's Twite (*LINOTA RUFO-STRIGATA*).

Nidification similar to *C. Severtzovi* and *P. pulcherrimus*.

Adams's Mountain Finch (*MONTIFRINGILLA ADAMSI*). Tib.---“*Ab Je*.”

This bird is common at Phari, where it nests at the beginning of June in the disused holes of the Mouse hare.

The Red-necked Mountain Finch (*MONTIFRINGILLA RUFI-COLLIS*).

Nidification is similar to that of *M. adamsi*. A note appeared at p. 221 of Vol. XX.

The House Sparrow (*PASSER DOMESTICUS*). Tib.--“*Kang che*.”

The House Sparrow is very common and nests throughout the summer.

The Cinnamon Tree-sparrow (*PASSER CINNAMOMEUS*).

Nests were taken at Gyantse in old walls, but unlike the House Sparrow, not in inhabited houses.

The Sand-martin (*COTILE RIPARIA*).

I found a great many sand martins' nests in a cliff at Rham tso (14,700) on 2nd June 1908.

The Crested Lark (*GALERITA CRISTATUS*).

Kala (14,000) Two nests containing 3 eggs each were found on 30th June 1908.

Elwes's Horned Lark (*OTOCORYS ELWESI*).

Rham tso (14,700), and Tangla (15,200). Nests are common in June, and usually contain two eggs but sometimes three.

Brooke's Short-toed Lark (*CALANDRELLA BRACHYDACTYLA TIBETANA*).

Very plentiful at Gyantse (13,100), where it nests in May. A little later in the year, I have found nests at higher altitudes up to the Tangla (15,200); the latest nest was taken on 10th July 1908.

THE IMPROVEMENT IN THE YIELD AND QUALITY OF INDIAN WHEAT

BY

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I. INTRODUCTION.

In the present paper it is proposed to give a sketch of the wheat investigations in India which have formed a part of the work of the Section of Economic Botany of the Agricultural Research Institute at Pusa during the past five years from 1906 to the present time. While the actual results obtained and especially those results which bear on the Indian wheat trade will naturally receive most attention in this paper, an attempt will also be made to indicate the scientific methods which have been adopted in prosecuting these investigations. In this way it is hoped that this paper will prove of interest both to those particularly concerned with the trade aspect of wheat and also to the members of a scientific society who will not be disappointed to find that the results obtained in applied work must be based on sound biological principles.

It is almost superfluous to point out the great importance of the wheat crop to India, not only from the point of view of the food of the people, but also as regards the value of the export trade. Nearly 30,000,000 acres of wheat are grown every year and in favourable seasons from 8 to 9 millions tons of grain are produced, of which more than 80 per cent. is consumed in the country. The surplus forms an important article of trade with Europe.

The recent investigations on wheat in India date from January 1906 when one of us was asked to draw up a scheme for the improvement of the wheat crop for consideration by the Board of Agriculture in India. This memorandum was adopted by the Agricultural Department as the basis for future work on Indian wheat.

II. THE AGRICULTURAL SURVEY OF THE WHEATS OF INDIA.

The first condition for the improvement of any crop is the acquisition of an intimate knowledge of that crop and of its production in all its manifold details. In the case of a European dealing with an Indian crop and with an agriculture essentially different from that of North Europe, the need for the closest possible study of the local conditions cannot be over-estimated. In India the present agricultural practices are firmly established on the basis of long traditional experience. The wheats at present in cultivation in this vast Empire represent the survival of types most fitted for the conditions of the various tracts. Nature has eliminated the unfit, and the experience of past centuries, handed down by tradition has taught the cultivator what soils and what tracts are most suitable for this crop. Varieties of wheat introduced by sea from other countries, have, in recent times at any rate, had no influence on the crop and have not been adopted by the cultivators. As far as can be ascertained no new forms have been introduced by selection or hybridization as has been the case in Europe and America. From two points of view, therefore, the position is of particular interest. In the first place, we are dealing with an ancient agriculture, in the second, with a crop which has left almost entirely to natural influences.

The necessity of studying the kinds of wheat now grown in India needs little explanation. When the crop has been thoroughly surveyed the investigator is able to see how far the present wheats are suitable for local purposes and also for the export trade. He will perceive where improvements can be made with the greatest chance of success and in what directions his science can be most profitably applied.

Fortunately in 1906 when this work was taken up considerable progress had been made in the various Provinces in collecting and growing at a central station most of the mixed wheats from the various Districts. In the Punjab and in the United Provinces especially this collection of material proved of the greatest value to us in rapidly ascertaining the kinds of wheat now grown in the Plains. At the same time a large collection of Indian wheats was

grown by us at Pusa under dry farming conditions and later on at Lyallpur on the Chenab Colony of the Punjab under canal irrigation. In this way we were enabled to begin acquiring first-hand experience of growing wheat under Indian conditions. This experience has proved essential to the development of the work and any success we have obtained therein has been, in our opinion, largely due to our having taken up the agricultural side of the work in addition to its more purely botanical aspect.

It was found that the wheat crop as grown by the cultivators was in almost all cases a mixture of a large number of varieties and that the first thing to do was to resolve these mixtures into their constituents. No useful work can result from dealing with these mixtures. Some of the constituents may be really excellent types in all respects, but their agricultural characters and milling and baking qualities, would be masked by the mass of inferior sorts making up the bulk of the sample. All that an examination of such samples would tell us is the average quality of all the wheats of any particular tract.

Two distinct stages are involved in the resolution of these wheat mixtures. In the first place the various species are separated into their botanical varieties and this is done by an examination of the ripe ears in the laboratory. The second stage in the resolution of the mixtures is the separation of the botanical varieties (which in the laboratory appear uniform) into what we have called agricultural types. If a large number of ears of the same botanical variety are sown separately next to next and the cultures examined it will in many cases be found that they differ from each other in many field characters such as foliage, general habit of growth, time of flowering, resistance to rust, standing power and in yield and quality of grain. These field characters are not recognised by systematic botany, but they are of by far greater importance to the cultivator than colour of chaff, etc. Thus what a systematic botanist would call a pure wheat is often a mixture of many different kinds. The determination of the ultimate units of our mixtures can therefore only be done by the close study in the field of a large number of cultures each starting

from one ear. As a rule this involves at least three years' work and if there are any accidents a longer period.

This tedious separation of the mixed wheats of a Province into their ultimate constituents is an example of that drudgery in scientific work which is so often necessary. As the wheats are being separated and grown singly their agricultural characters, rust resistance, yielding power and milling and baking characters can be studied. At the same time suitable material for selection and hybridization work becomes available.

III. IMPROVEMENT OF WHEAT BY SELECTION.

In order to appreciate the modern methods of selection, which can be applied to a crop like wheat, which normally self-fertilizes, it is necessary to realise the constitution of an Indian wheat-field and also the complexity of most of the botanical varieties of wheat in India. As we have seen the botanical varieties can be separated into agricultural types differing from each other in field characters. It is these types which form the raw material as it were for improvement by selection. The assemblage of individuals constituting an agricultural type is termed a population and these individuals may differ from each other in yielding power. If they do the pure line which has the highest yielding power can be separately propagated, and if it is a desirable wheat in all other respects its selection and separate growth will constitute an improvement. The essence of selection therefore depends on the comparison of the offspring of single plants and not on the comparison of the plants themselves. Once the best pure line in an agricultural type has been selected it is believed that no further improvement is possible by this method. All that is necessary is to maintain the improvement.

Applying these principles to the wheats of India, we have been able to isolate a number of wheats of exceedingly high grain quality, some of which are being exhibited to-day. Some of these high quality wheats also yield well, are rust resistant and are being grown this year on a large scale at a number of stations in the plains. The best of these will be grown on a much larger scale and will be distributed to the cultivators in those tracts which suit their particular requirements.

IV. HYBRIDIZATION.

Besides selection there is another method by which the kinds of wheat grown in India can be improved, namely, hybridization, or the application of the principles which have been founded on the work of Mendel. By means of this method, it is possible to create new wheats combining the desirable qualities of both parents. Hybridization has greater possibilities than selection, but on the other hand the process is laborious and time consuming as the production and testing of a new wheat hybrid cannot be done under four years.

Hybridization like selection is only possible after the separation of mixed wheats into their ultimate constituents. In modern wheat breeding it is desirable to use for crossing only pure lines, *i.e.*, the progeny of single plants. It frequently happens when a wheat mixture has been resolved into its constituents that all the desirable qualities are not found in any one wheat. Thus some wheats, characterised by high-yielding capacity, may be defective either in quality, in resistance to rust or in strength of straw. Others, on the other hand, may possess these latter characters, but may give poor yields. It is in producing new wheats, perfect in all respects, that hybridization as a method of improvement has its value.

Passing over the inheritance of ordinary morphological characters of wheat, such as the presence or absence of beards, colour of the chaff and grain, and so on, the characters of special value in wheats are quality of grain, yielding power, strength of straw and resistance to rust. It is found in breeding that all these qualities and their opposites behave as unit characters and pass over as a whole to the various hybrid generations. For example, when a rust liable and rust resistant wheat are crossed, the plants of the first hybrid generation are all rust-labile like one of the parents. In this generation the rust resistant character of the other parent is latent or recessive. Rustiness, on the other hand, is said to be dominant. In the second generation, however, splitting takes place in the proportion of three rusty plants to one rust-resistant plant. These latter in succeeding generations breed true as

regards this character. It is possible, therefore, by crossing to introduce the character of rust-resistance into a wheat wanting in this quality. Similarly such characters as high grain quality, high-yielding power and strength of straw can be introduced into a wheat defective in these characters.

Some examples of the use of hybridization in producing new wheats will give an idea of the value of the process. Two of the highest-yielding wheats in the alluvium, namely, Punjab Type 9, and Muzaffarnagar are deficient in quality. Some of our Pusa selections, on the other hand, possess grain of exceedingly high quality, but their yielding power is only moderate. Suitable crosses were made between these two high-yielding wheats of poor quality and two wheats with very high quality but lower yield. In the third and fourth generations of the progeny of these crosses, we have been able to select and fix wheats which possess the high-yielding power of one parent with the high-grain quality of the other. We thus possess as it were Muzaffarnagar and Punjab No. 9 with high-quality grain instead of low; and we have been able to increase the value of their grain by about eight annas a maund. It is expected that the new fixed wheats from these crosses will be found suitable for large tracts of the Punjab and the United Provinces. Some of them are being grown this year at Cawnpore under canal irrigation by Mr. H. Martin Leake, the Economic Botanist to the Government of the United Provinces, and give every promise to surpass in yield any other wheats in cultivation there.

Some of the most interesting hybridization work at Pusa consists in breeding rust-resistant wheats and in increasing the standing power of the straw. At present the yield of wheat at Pusa is limited by both these factors. Till we get wheats with stronger straws, we cannot increase the present yields. It is also desirable to increase the resisting power to rust.

Out of the large number of wheats grown at Pusa one known as "American Club" received from England proved most resistant to rust under Indian conditions. Unfortunately, however, it comes into ear much too late to be used as a parent and at a period in the hot weather when crossing is the out of

question. This difficulty has been got over as follows. Last spring the wheats on which we desired to cross American Club were sent to Cambridge and grown by Professor Biffen on the University farm as spring wheats. While we were on leave in June, these Indians were crossed on to American Club and other resistant wheats at Cambridge and the hybrid seeds were sent out by Professor Biffen in time for sowing at Pusa in October. The first generation has now yielded seed, and next year the isolation of new wheats with the rust-resisting power of American Club will begin.

V. THE MILLING AND BAKING QUALITIES OF INDIAN WHEATS.

Wheats differ to a great extent in the ease with which they are ground in the mill and also in the amount and quality of the resulting flour. It is obvious that reliable information on such matters can only be obtained by actually milling and baking a sample of wheat. For this reason milling and baking tests are essential in wheat improvement. In the conduct of this portion of the work we have been fortunate enough to secure the active co-operation of the highest authority in the Empire on milling and baking questions, namely, Mr. Humphries of Weybridge, a former President of the Incorporated National Association of British and Irish Millers. Mr. Humphries was mainly responsible for bringing about the general acceptance of the new form of contract under which Indian wheat is now sold in England and under which wilful adulteration before shipment has been practically prevented.

From the milling point of view the desirable characteristics of a wheat are that it should be free from admixture with dirt and other seeds, that it should be well grown, uniform in colour and consistency, that it should have a thin skin, absorb a large quantity of water before grinding, that it should mill freely and allow the separation of bran and flour to be made without excessive grinding. From the baking point of view the resulting flour should be of good colour (preferably greyish white) and should yield stable resilient dough and large well-shaped loaves.

Some of these desirable qualities are already possessed by many

Indian wheats, namely, a great capacity for absorbing water in milling and a high percentage of flour. Their chief undesirable characters are frequent unevenness in texture and colour and the want of resiliency in the dough leading to small loaves with very poor looking crusts and bad flavour. In consequence, Indian wheats cannot be made into bread by themselves, but have to be blended with strong Canadian and Russian grades.

In improving the wheats of India for the export trade we have set before us a somewhat high standard, namely, the production of wheats at least equal to any on the English Market. Taking into account all the factors I think we can fairly claim success as far as the wheats grown at Pusa are concerned. We have succeeded in growing absolutely uniform wheats high in nitrogen with first-rate milling qualities and with high percentages of flour. The loaves made are of the same class as those made from the strongest Canadian and American grades, but are not quite so large as those given by Manitoba wheat. On the other hand our best Pusa wheats absorb more water in milling than the Manitoba grades and give a higher percentage of flour. During the last two years the new Pusa wheats sent for testing to England have been compared with the best Canadian Spring wheats with what results will be evident from the following extract from Mr. Humphries' last report:—

“The three lots, Nos. 100, 101 and 106 are very beautiful wheats also. On appearance only there is little to choose between them. If anything 106 may be the best looking. These three and Pusa 4 all behave very well indeed in the milling processes. The flours they all yield are granular, that is to say, they are bread flours rather than biscuit or pudding flours, and should be judged by comparison with hard spring wheat flours from Minneapolis or Manitoba rather than by comparison with Muzaffarnagars or similar wheats. They are all flours possessing great potentialities as regards baking value, which can be developed by proper treatment during milling and baking on the special lines mentioned hereinbefore. Without this special treatment they behave very well in the dough and produce loaves of fair but not great volume, and of first-rate appearance and flavour. They

behave like Manitoban good grade wheats produced in a dry season. That is to say, they like such Manitobans, respond very markedly to the addition of malt extract and "yeast foods" and the volume of the loaf can be increased very greatly by the use of the right malt extract. They seem to be possessed of very good qualities, capable, under favourable conditions, of yielding extremely good results.

"I have not enough of these varieties left to see how they behave in combination with other wheats, but I believe they would do very well indeed under such conditions. At any rate, I would, as a buyer, be prepared to pay substantially more money for them than for any of the ordinary Indian wheats of commerce."

Translated into money the improved Pusa wheats are worth from 8 to 10 annas a maund more than the ordinary wheats of commerce. When we consider that the annual export trade in Indian wheat amounted in 1904-05 to over 2,000,000 tons valued at 18 crores of rupees it is clear that a much smaller general improvement than has already been obtained would greatly benefit the cultivator and the merchant. It is bound to be to the advantage of all concerned to deal in an improved product.

VI. THE CONSUMPTION OF WHEAT IN INDIA.

By far the largest portion of the wheat grown in India is consumed in the country. Anything from 80 to 90 per cent. of the total crop is used locally, the balance being exported. The question naturally arises what wheats are preferred by the people for their own food. From the point of India this question is more important than that of the wheats in greatest demand on the English market. Fortunately for the improver of Indian wheats the same class of produce best suits the local demands of India and also the requirements of the Home millers. If we can improve the wheats in greatest demand in India for food we shall at the same time fulfill the demands of the trade. There is therefore only one objective.

During the past four years we have constantly made enquiries in the villages of the Plains as to the wheats preferred by the cultivators for their own food. They invariably show us hard reds or

hard whites and frequently say that the soft whites are deficient in feeding value. From the chemical point of view their choice is sound as the hard whites and hard reds are richer in proteids and therefore better and more sustaining food than the soft whites and soft reds.

Recently at the Allahabad Exhibition a group of cultivators interested in wheat-growing were asked to select from a set of samples the wheats they would prefer for their own consumption. Without hesitation they selected those which Mr. Humphries had found to be the best for bread-making in England and rejected those which only behaved in the tests like ordinary Indians. This group of cultivators are growing next season 50 maunds of the six best wheats we have so far produced. We mention this circumstance to show that there will be no prejudice on the part of the ryots against the appearance of our improved wheats.

VII. IMPROVEMENT IN THE YIELD OF WHEAT.

Great improvements are possible in the yield of wheat in India by the more skilful use of the means at present at the disposal of the cultivators. The average yield per acre in the botanical area at Pusa is more than twice that obtained by the people and similar results have been obtained in the botanical area of the Cawnpore Experiment Station under canal irrigation. The average yields at Pusa obtained by crop weighings on quarter acre plots in 1909 and 1910 is somewhere in the region of 30 maunds or 2,500 lbs. per acre. These yields have been obtained without manure, without rain or irrigation and on land which has been under wheat continuously for four years. There is no visible diminution in fertility but on the contrary the land is getting too fertile and there is a tendency for the wheat to grow too rank and tall and to be damaged by heavy winds at the time it comes into ear. At Cawnpore the results are similar and some of the new Pusa hybrids there are expected this year to give about 25 maunds (over 2,000 lbs.) to the acre. We believe similar results are possible all over the plains and that an increase of at least 50 per cent. in the outturn is possible in the alluvium in both the *rabi* and *kharif* crops. There are great trade possibilities involved in

these matters for the reason that only the surplus production of wheat and other seeds is exported. Any increase therefore in the present crops will leave a far greater margin for trade and might even enable India to undersell her competitors in the seed markets of the world.

We will now deal with the methods of cultivation and soil management under which these high yields can be obtained continuously on the same land.

Hot weather cultivation. The exposure of the wheat lands by iron ploughs in the hot weather of April and May is, we consider, one of the chief causes of the increased yield and continued fertility of the wheat land. Exposure of the land is beneficial in two different ways. In the first place all the early monsoon rainfall is absorbed by the soil and the loose open surface soil enables water to reach the subsoil and to be stored up as it were for the next *rabi* crop. If the *rabi* stubbles were properly broken up before the monsoon in the plains, an enormous amount of the water which now runs off the hard surface into the rivers, would be absorbed by the soil. In this way the irregularities of the monsoon would be of less importance to India and less irrigation water would be required. The year 1908 was one of very short and badly distributed rainfall at Pusa, when about 22 inches fell during the whole year. In spite of this over 25 maunds of wheat to the acre were grown at Pusa without irrigation and without rain after sowing time. The cultivators' crops failed and a famine was declared in the District.

The second way in which the exposure of the soil in the hot weather is beneficial is in increasing the fertility of the land. Exposure of the soil to the hot weather acts as if the land had been manured and the explanation of this increase in fertility is, we consider, a bacteriological one. As is well known the soil is exceedingly rich in bacteria of many different kinds some of which are essential to plants in breaking down organic matter for the production of nitrogenous salts which are taken up by the roots in the soil water. Besides these useful bacteria other bacteria and soil organisms sour the soil and destroy the useful bacteria. Exposure of the land has the effect of partially sterilising the soil

and in destroying wholesale a large part of the soil flora. When the rains fall the spores of the various soil bacteria again become active, but it would appear that the new soil flora is more efficient than the old from the point of view of the plant.

Small iron ploughs are much more efficient instruments in exposing the land in the hot weather than the common country wooden plough. When the cultivators have been taught by example the real use of these ploughs, a great market is bound to arise in the plains and another outlet will be found for Indian steel. The cultivator already practices this to a limited extent and already appreciates the value of exposing his lands in the hot season. It will be a comparatively easy matter therefore to teach him to do this more efficiently than at present and to do it on a much larger scale with more effective implements.

Conservation of moisture. The next step in managing wheat lands in the alluvium is concerned with the conservation of moisture. Besides the hot weather cultivation one or two ploughings with iron ploughs in the breaks of the early part of the monsoon will enable more and more water to be taken up by the subsoil. After the end of July iron ploughs are given up and the wooden country plough is used instead as this packs the subsoil and also produces sufficient upper loose soil to take in more water. The beam is now also used after ploughing to prevent loss by evaporation in the breaks of the monsoon. After the sowing rains—the last of the monsoon shower of September—the land is finally levelled (or harrowed in case it is very heavy land) and left till sowing time. Sowing is done preferably in the morning behind the country plough and the land is immediately covered in with the beam which must be passed over the land several times. After the wheat begins to tiller the land is rolled once or twice and nothing more is done till harvest.

The essence of the process consists in absorbing as much water as possible in the monsoon and in taking steps not to lose it afterwards. Very little cultivation is done just before sowing time as at this period moisture is easily lost. The ryot commonly leaves his preparation for wheat till the last fortnight before sowing and during the process a large amount of moisture is lost. At Pusa

our tilth for wheat is obtained in the hot weather before the monsoon and never lost afterwards.

Green manuring. In getting land in a good state of cultivation for wheat and in improving its water-holding capacity we have found green manuring with *san* hemp the best method. After a crop of this is ploughed in green in the monsoon the land is much more easily worked and less force is required in ploughing the land after wheat. If after a few crops of wheat we find at Pusa that the supply of organic matter in the soil needs replenishment it will be easy to plough in a green crop of *san* and bring the land back again without omitting a single wheat crop.

The methods of cultivation and soil management we have indicated are capable of adoption throughout the plains with of course any necessary local modifications. We believe if these methods were carried out a great increase in crop production would be possible, less water would be required for irrigation and much more would be got out of the Indian monsoon.

The methods we have adopted are often referred to as dry farming methods. We prefer to regard them as merely the application of common sense to crop production in the plains.

VIII. FUTURE WORK.

It has already been shown that both in the yield and quality of wheat considerable progress has been made at two of the Experiment Stations in India. New wheats are now available which, if generally cultivated by the people in the way described above, would rapidly raise the quality and volume of the wheat exported from India. All this can be done with the means within the reach of the people. All that is required is greater care in cultivation and in the conservation of moisture. In bringing about these improvements our first task will be the conversion as it were of the Agricultural Department itself after which the active support of the bureaucracy will naturally follow. At this point the assistance and co-operation of the wheat merchants themselves will be necessary so that whole

shipments of improved wheats can be made and proper arrangements made for their purchase in India, for their sale in England and for making known their merits to the English millers. We have every reason to believe that the merchants concerned will give their hearty support in these matters and we believe that before very long the whole weight of the official influence in the country will be on the side of the Agricultural Department in placing the production of wheat and other crops on a higher plane than it is at present.

A NEW SNAKE FROM THE WESTERN HIMALAYAS.
TRACHISCHIUM QUINQUELABIALIS.

BY

Major F. WALL, I.M.S., C.M.Z.S.

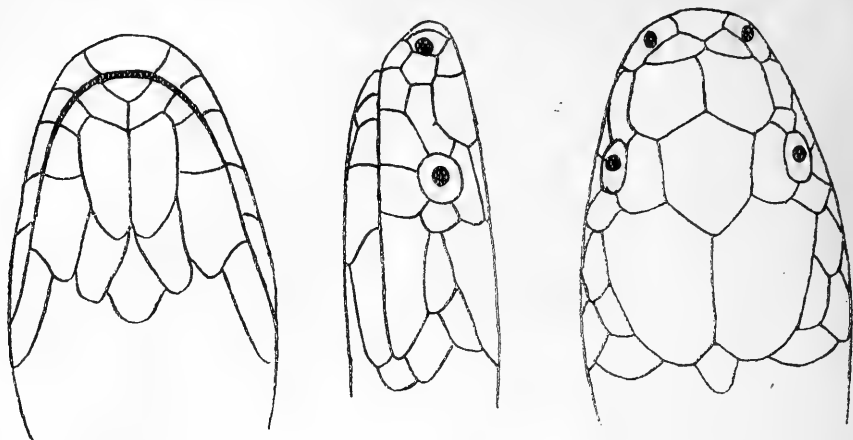
In 1909 I sent to the British Museum a *Trachischium* from Muktesar (circa 7,500 feet) which appeared a new species, but which I preferred at the time to regard as an aberrant *T. tenuiceps*.

Mr. Boulenger in acknowledging the specimen considered it a distinct species.

I have now obtained a second specimen which leaves no doubt in my mind that the species is one hitherto undescribed. This specimen was obtained from the Naini Tal District, exact locality and altitude uncertain, but one may infer the latter to be above 6,000 feet, since a specimen of the Himalayan viper (*Ancistrodon himalayanus*) was in the same bottle.

Only one specimen of this genus has ever been recorded from the Western Himalayas previously, viz., *T. fuscum*, found by Dr. N. Annandale in Gilgit, and described by him as a new snake under the name *Ablabes gilgiticus* (J. A. S., Bengal, 1905, p. 210).

It appears to me that my new species resembles *T. tenuiceps* most closely, but differs in having only one postocular and only 5 supralabials. The temporal thus touches but one labial (the 5th), differing from all the other species in which it touches the 5th and 6th. In my first specimen the internasals were completely separated by the rostral, and the loreal shield found contact with the internasal, but in the second specimen the internasals are narrowly in contact, and do not meet the loreal. On the left side the præocular is partially confluent with the loreal in the second specimen.



Description : *Rostral*.—Touches 6 shields, and may extend back so as to completely separate the internasals. *Internasals*.—A pair; the suture between them $\frac{1}{3}$ rd to $\frac{1}{4}$ th, that between the præfrontal fellows. *Præfrontals*.—A pair; the suture between them subequal to the præfronto-frontal; in contact with internasal, (postnasal sometimes), loreal, præocular, and supraocular. *Frontal*.—Sutures subequal; breadth twice that of supraoculars, length one-fourth greater than supraoculars. *Nasals*.—Two, the nostril pierced entirely in the anterior. *Loreal*.—One, sometimes in contact with the internasal. *Præocular*.—One. *Postocular*.—One. *Temporal*.—One, in contact with only the 5th of the supralabial series. *Supralabials*.—5, the 3rd and 4th touching the eye; the 5th as long as the three preceding shields. *Sublinguals*.—Two pairs, the anterior larger. The posterior touches the 4th only of the infralabials. *Infralabials*.—4, the 4th largest, and in contact with two scales behind. *Costals*.—13 in whole body length. *Ventrals*.—141 and 142. *Anal* divided. *Subcaudals*.—38 and 39. *Colour*.—Blackish-brown dorsally, each scale, especially those in the flanks rather lighter centrally. Belly nearly uniform white (yellowish?). Some sparse mottling occurs in its posterior half towards the median line and beneath the tail.

My second specimen measured $11\frac{3}{4}$ inches, the tail accounting for 2 inches.

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB,
NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Colonel C. J. BAMBER, F.L.S.,

Indian Medical Service.

PART IX.

(Continued from page 1102 of Volume XX.)

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS SMALL, IN HEADS.

Dipsacus inermis,
Teasel.

DIPSACEÆ.

F. B. I. iii. 217.

Himalaya, 6-12,000 ft.

Simla, Mashobra

(Collett).

Changlagalli (Douie).

large, stout, rough with stiff hairs, roughest under the flower heads; leaves 3-12 ins., lower leaves deeply divided, end lobe largest, upper, ovate or lanceolate or some divided into three lobes, shortly hairy on both surfaces, stalks dilated, united at the base; flowers white, small, many, in nearly round terminal long-stalked, solitary or several heads, 1 in. diam., surrounded by 6-8 spreading, leaf-like bracts, bracteoles or scales on the base of the head (receptacle) concave, abruptly narrowed in long, fringed, spine-like points, projecting above the flowers when in bud, calyx double owing to an epicalyx (involucel), calyx proper cup-shaped, hairy, 4-angled, 4-lobed on the achene, epicalyx 8-ribbed, surrounding the achene, corolla velvety, unequally 4-lobed, stamens 4, anthers protruding, stigma linear; achene with the 8-ribbed epicalyx, crowned with the calyx, which falls off later.

Dipsacus strictus,

DIPSACEÆ.

F. B. I. iii. 217.

Himalaya, 7,000 ft.

Chamba.

very like the last species, but larger, more of the leaves undivided, flowers cream coloured, and fewer heads.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS SMALL, IN HEADS.

Scabiosa Olivieri,**Scabious,**

DIPSACEÆ.

F. B. I. iii. 219.

The Low Hills of

Peshawar (Vicary)

Rawalpindi.

Hazara (Stewart).

The Park, Rawalpindi.

Baluchistan (Stocks).

small, annual, branched, hairy, stem leafy; leaves 2 by $\frac{1}{4}$ in., narrowly oblong, slightly toothed, or 4 by 2 in., deeply divided into pointed lobes; flowers purple, small, in few-flowered small terminal heads, bracts $\frac{1}{4}$ in., oblong-lanceolate, surrounding the heads, calyx of 2 portions, epicalyx (involucl) $\frac{1}{4}$ in. diam., 16-20 ribbed, calyx proper with short teeth and bristles $\frac{1}{3}$ in. barbed, brown, corolla tubular, 4-5 lobed, all equal, much shorter than the calyx-bristles, hairy without, stamens 4, style filiform; achenes crowned by the epicalyx and calyx-bristles, silky.

Scabiosa speciosa,

DIPSACEÆ.

F. B. I. iii. 219.

Himalaya, 7-9,000 ft.

Kashmir

Kagan (Donie).

medium size, branched, rootstock perennial; leaves 2 by $\frac{1}{3}$ in., oblong, pinnatifid at the base with small lobes; flowers mauve, small, in many-flowered large terminal, stalked, radiate heads, bracts $\frac{1}{2}$ - $\frac{2}{3}$ in., narrowly oblong, involucl $\frac{1}{16}$ in., nearly bell-shaped, calyx-bristles nearly black, corolla with ray $\frac{3}{4}$ in., corolla without ray in the centre of the flower $\frac{1}{2}$ in.; achenes $\frac{1}{4}$ in., silky below, upper 8-ribbed, deeply pitted within the ribs; otherwise like the last species.

Bidens tripartita,**Bur-Marigold.**

COMPOSITÆ.

F. B. I. iii. 309.

Himalaya, 3-5,000 ft.

Dharmpur.

medium-size, annual, smooth, velvety above; leaves 3-5 in., digitately 3-5-lobed, lobes lanceolate, toothed, terminal longest; flowers yellow, small in discoid heads, $\frac{3}{8}$ in. diam. on short, erect stalks, bracts longer than the flowers, in 2 or 3 series joined below, outer green, longer than the flowers, inner thin; receptacle with narrow flat scales nearly as long as the flowers; calyx (pappus) of two barbed bristles on the achene, corolla-tubes narrow, dilated at the top, 5-toothed; style arms hairy; achenes $\frac{1}{4}$ in., smooth, wedge-shaped, barbed along the sides, bristles very short, two.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS SMALL, IN HEADS.

***Bidens pilosa*,**

COMPOSITÆ.

F. B. I. iii. 309.

Var. *pilosa* proper.

The Plains to 6,000 ft.

Valleys below Simla

(Collett).

Kasauli.

small, hairy or smooth; leaves 3-5 in., pinnate, leaflets 3-5, ovate, toothed; flowers tubular in the centre, along the edge supplied with white ligules or rays, pappus of 3 barbed bristles; achenes linear rough; otherwise like the last species.

***Bidens Wallichii*,**

COMPOSITÆ.

F. B. I. iii. 309.

Var. *bipinnata*.

The Plains to 8,000 ft.

Simla (Collett).

Dewal (Douie).

Dharmpur.

very like the last species, but the leaves are twice pinnate, segments cut and lobed variously, and ligules yellow.

***Glossogyne pinnatifida*,**

COMPOSITÆ.

F. B. I. iii. 310.

The Plains.

small, perennial, root spindle-shaped, woody, stem and branches slender, forked, sparingly leafy; leaves 1-2 in., with the stalk, triangular, divided into linear, pointed segments, few, often turned down, leathery, flowering branches 6-12 in., straight, stiff, grooved; flowers yellow, small, in few small heads, $\frac{1}{4}$ in. diam., arranged in flat-topped clusters, heads with flowers all tubular or central ones tubular and outer ligulate, receptacle small, flat, scales thin, bracts in 2-3 series, $\frac{1}{6}$ in. blunt, narrow, joined below, pappus (calyx) of 2 bristles, rough from reversed hairs, corolla tubular, 5-toothed, anther bases blunt, style arms with long hairy tips; achenes $\frac{1}{4}$ - $\frac{1}{3}$ in., deeply grooved, black.

STAMENS FOUR.

***crophularia lucida*,**

SCROPHULARIACEÆ.

F. B. I. iv. 256.

Himalaya, 8-10,000 ft.

Kashmir.

medium-size, perennial, stout, stems somewhat 4-angled, smooth or glandular, velvety; leaves 1-2 in., singly or doubly pinnately divided, segments spreading very unequal, oblong, ovate or lanceolate margins deeply cut or toothed, horizontal; flowers

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS FOUR.

small, dingy green-purple in opposite stalked loosely spreading clusters, forming terminal branching racemes, bracts linear, calyx 5-fid, lobes half as long as the corolla, rounded, margin thin, corolla-tube $\frac{1}{4}$ - $\frac{1}{3}$ in., broad, very short, lobes 5, two upper longer than the others, lowest spreading, stamens 4, lin. unequal pairs, turned downwards, hardly projecting out, staminode round or kidney-shaped; capsule round, few seeded; seeds oblong, deeply pitted.

Scrophularia variegata, very like the last species, but the leaves are less
 SCROPHULARIACEÆ. pinnatifid, being only pinnatifid at the base with
 F. B. I. iv. 256. blunt recurved lobes.
 Himalaya, 9-14,000 ft.

Scrophularia scabiosa- one variety like a *Scabiosa* with a woody root-
folia, stock and many radical pinnatifid leaves and a
 SCROPHULARIACEÆ. scape-like branching raceme, the other very like
 F. B. I. iv. 256. *Scrophularia lucida*, but with very minute flowers
 N. West Frontier Hills $\frac{1}{10}$ in.
 near Peshawar
 (Vicary, Aitchison).
 Chakwal (Douie).

Veronica verna, see Herbs, Erect, Opposite, Exstipulate, Simple,
 Entire.

Leptorhabdos see Herbs, Erect, Alternate, Exstipulate, Lobed.
Benthamiana,

Pedicularis pectinatas, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis tennirostris, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis gracilis, see Herbs, Erect, Alternate, Exstipulate, Lobed.

Pedicularis porrects, see Herbs, Erect, Alternate, Exstipulate, Lobed.

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS TWO.

Martynia diandra,
Tiger or Devils Claw,
 PEDALIACEÆ.

F. B. I. iv. 386.

Himalaya, 1-2,000 ft.

Dunera, Gur d a s p u r
 District

large, rough, stem succulent, [an American weed ;
 eaves 5-10 in. diam., round, or angled, thin, long-
 stalked, sometimes upper alternate ; flowers $1\frac{1}{2}$ -3
 in., pale pink, showy in axillary and terminal clus-
 ters, calyx 4-5 lobed, corolla bell-shaped, and
 inflated on one side, somewhat 2-lipped, 5-lobed,
 stamens 2, capsule 1 in., woody covered with a soft
 coat soon falling off, beaked by strong curved
 spines, that catch on to any passing animal.

STAMENS FOUR.

Sesamum indicum,

see Herbs, Erect, Opposite, Exstipulate, Simple,
 Toothed, Corolla two-lipped, Stamens four.

Verbena officinalis,
Vervain,
 VERBENACEÆ.

F. B. I. iv. 565.

The Plains to 7,000 ft.
 Simla (Collett).

Phalia in the Gujrat
 District.

Kahuta. Murree
 (Douie).

Hazara (Barrett).

medium-size, perennial, nearly smooth, stems 4-
 sided, branching ; leaves 2-4 in., variously lobed,
 sometimes ovate, toothed, base narrow, lower leaves
 stalked, upper sessile, usually divided into three ;
 flowers $\frac{1}{4}$ in., blue or lilac, sessile in long slender
 bracteate spikes, branching, 3-10 in. long, calyx
 $\frac{1}{16}$ - $\frac{1}{12}$ in., tubular, glandular-hairy, 5 minute teeth,
 corolla hairy, tube nearly cylindric, longer than
 the calyx, lobes 5, spreading, stamens 4, in unequal
 pairs, enclosed in the corolla, style short, stigma
 round ; fruit of 4 nutlets enclosed in the calyx ;
 nutlets $\frac{1}{16}$ in., oblong, 3-ribbed, inner faces with
 minute white flaking cells.

Leonurus gardiaca.
Motherwort.
 LABIATÆ.

F. B. I. iv. 678.

Himalaya, 6-10,000 ft.
 Narkanda (Collett).

large, root stock and stem stout ; leaves velvety
 to felted beneath, lower 5 by 3 in., ovate lance-
 olate or round, toothed or deeply and irregularly
 cut into several coarsely toothed lobes, long stock-
 ed, upper 1-3 in. narrow, lobed or nearly undivided ;
 flowers $\frac{1}{2}$ in. long, pink, in many dense axillary clus-
 ters forming long terminal spikes, bracts large,
 lower stalked, bracteoles spinous, calyx $\frac{1}{8}$ in., top-
 shaped, 5-nerved, 5-toothed, teeth triangular,
 spines long, corolla-tube ringed within, 2-lipped,

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNITED.

STAMENS FOUR.

upper lip erect, hooded, silky, lower spreading, 3-lobed, mid-lobe longest, stamens 4, ascending under the upper lip, nutlets 4, sharply 3-angled, smooth.

PETALS NONE.

Galtha palustris, see Herbs, Erect, Alternate, Exstipulate, Lobed.

COMPOUND LEAVES.

Biophytum sensitivum, see Herbs, Erect, Opposite, Stipulate, Compound.

Bryophyllum calycinum, see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Reseda pruinosa, small, perennial, curved with minute projections, leaves 1-2 in., lower leaves lanceolate, upper cut into linear segments, stipules glandular, minute, flowers very small, nearly sessile in terminal dense racemes, bracts awl-shaped, soon falling off, minute, calyx persistent, sepals 4-7, petals 4-7, stalked, unequal, much divided, that on the posterior side with a membrane above its stalk, stamens 10-40, stigmas sessile; capsule oblong or ovoid, short, widely open, many sided, seeds many, kidney-shaped.

RESEDACEÆ.

F. B. I. i. 181.

Hills of the Western Punjab (Vicary).

Oligomeris glaucescens, small, annual, with a bluish waxy gloss, much branched; leaves 1-2 in., narrowly linear, in tufts, stipules minute, awl-shaped; flowers minute, greenish-white in bracteate dense-flowered, terminal spikes, calyx of 4 sepals, petals 2, alternate with the posterior sepal, stigmas sessile; capsule very small, 4-lobed, membranous, seeds many, minute, shining.

Bui.

RESEDACEÆ.

F. B. I. i. 181.

The Plains.

Shahpur (Douie).

Baluchistan (Boissier).

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

- Portulaca oleracea**, see Prostrate Herbs, Alternate, Stipulate, Simple.
- Crotalaria humifusa**, see Prostrate Herbs, Alternate, Stipulate, Simple.
- Crotalaria prostrata**, see Prostrate Herbs, Alternate, Exstipulate, Simple.
- Crotalaria hirsuta**, see Prostrate Herbs, Alternate, Stipulate, Simple.
- Crotalaria alata**, see Shrubs, Alternate, Stipulate, Simple.
- Crotalaria mysorensis**, medium-size, annual, much branched, covered with long silky hairs; leaves 1-3 in. long, linear-oblong, rounded at both ends, thinly silky, stipules small, linear, persistent; flowers $\frac{1}{3}$ - $\frac{3}{4}$ in. long, yellow in terminal and lateral, stalked racemes, 6-9 in. long, bracts lanceolate, leafy, calyx $\frac{1}{2}$ - $\frac{5}{8}$ in. long, silky; teeth 5, all long, upper lanceolate, lower linear, corolla not projecting beyond the calyx, petals 5, upper (standard) broad, round, stalked, lateral oblong, shorter, lower two united to form the keel, equal to the lateral, much curved in, and beaked, stamens 10, united behind, style long, abruptly incurved at the end, bearded above; pod nearly sessile, twice the length of the calyx, oblong, smooth, 20-30 seeded.
- Crotalaria sessiliflora**, medium-size, annual, stem unbranched or branched, silky; leaves 2-6 in., linear or lanceolate, narrowed to both ends, thick, smooth above, thinly silky below, stipules bristle-like, very small; flowers $\frac{1}{3}$ in., blue, rarely yellow, not projecting beyond the calyx, sharply bent down, lower flowers often axillary, upper crowded in racemes, 2-20 flowered, racemes 6-9 in. long, bracts and bracteoles bristle-like, persistent, calyx $\frac{3}{8}$ - $\frac{1}{2}$ in. long, brown silky, teeth all short pointed, upper $\frac{1}{3}$ in. broad, corolla smooth; pod sessile, smooth, $\frac{1}{2}$ in., seeds 10-15; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Indigofera linifolia, see Prostrate Herbs, Alternate, Stipulate, Simple.

Indigofera cordifolia,
LEGUMINOSÆ.

F. B. I. ii. 93.

The Plains to 4,000 ft.
in the Chenab Valley.

Kahuta (Douie).

Baluchistan (Baker).

small, annual, much branched, spreading, covered more or less with long white hairs; leaves $\frac{1}{4}$ - $\frac{3}{4}$ in., ovate, heart-shaped, apex a nearly straight edge, with a large stiff point, densely hairy beneath, stipules minute, bristle-like; flowers $\frac{1}{8}$ in., red, four to eight crowded together in a sessile cluster, calyx 5-toothed, tube short, teeth long, bristle-like, very hairy, corolla not projecting beyond the calyx, petals 5, upper one (standard) rounded, two lower ones united (keel) straight, not beaked, spurred on each side at the base, stamens 10, upper one free, the others united, anthers tipped with a minute point, style short, curved inwards; pod $\frac{1}{4}$ in. long or less, oblong, cylindrical, beaked, 2-seeded seeds ovate, yellow.

Uraria picta,

see Herbs, Erect, Alternate, Stipulate, Compound, Leaflets many.

Uraria lagopus,

see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Uraria neglecta,

see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Alysicarpus monilifer.

see Prostrate Herbs, Alternate, Stipulate, Simple.

Alysicarpus hamosus.

see Prostrate Herbs, Alternate, Stipulate, Simple.

Alysicarpus rugosus.

see Prostrate Herbs, Alternate, Stipulate Simple.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

***Sida grewloides*,**

MALVACEÆ.

F. B. I. i. 323.

The Plains.

Baluchistan (Boissier).

medium-size, grey-felted; with star-shaped hairs; leaves $\frac{1}{2}$ in. long, oblong-ovate, blunt-pointed, round-toothed, downy on both surfaces, leaf stalk shorter than the blade, stipules linear, awl-shaped, nearly equal to the leaf stalk; flowers small, $\frac{1}{8}$ in. diam., yellow or white solitary or in pairs on a common stalk, shorter than the leaf stalks, calyx of 5 angular sepals, angular-tubular below, petals 5, united together below and with the staminal-tube, staminal-tube dividing above into numerous filaments, styles 7-8; fruit of 7-8 carpels, carpels wrinkled, bristle-topped and beaked, beaks converging, seed one in each carpel. The flowers open at noon.

Abutilon graveolens*,Bara banghi*,

MALVACEÆ.

F. B. I. i. 327.

The Plains.

Bhansi, Gurgaon.

Baluchistan (Masters)

large, perennial, fresh leaves smell unpleasantly, branches covered with velvety glands and hairs; leaves $2-3\frac{1}{2}$ in., round heart-shaped, sometimes lobed, abruptly long-pointed, velvety on both surfaces, leaf-stalk almost as long as the blade, stipules linear sickle-shaped, turned back, soon falling off; flowers large, orange with dark centre, pink and turned back when old, on axillary and terminal stalk, as long as the leaf-stalks, and jointed above the middle, calyx of 5 sepals, ovate, long-pointed, tubular below, densely velvety, petals 5, broadly heart-shaped, united together below and with the staminal-tube, staminal-tube dividing above into many filaments, styles 20 or more; fruit of 20 or more carpels, rounded hairy, about equal in length to the calyx, which is enlarged in fruit, not bristle-pointed, separating from the central column, each carpel 2 or more seeded, seeds kidney-shaped. The flowers open in the evening; a fibre is obtained from the stem; the roots, leaves and seeds are medicinal.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Abutilon avicennæ,

MALVACEÆ.

F. B. I. i. 327.

The Plains to 5,000 ft.
Kashmir.

medium-size, annual, leafy, softly felted; leaves 3-4 in., round heart-shaped with a long point, leaf stalk 3 in. long; flowers yellow, scarcely longer than the sepals on solitary, axillary stalks 1 in. long, sepals nearly divided to the base, ovate, short-pointed, staminal-tube very short, carpels 15-20, much longer than the sepals, oblong, hairy or velvety with 2 long spreading bristles, seeds soft with scattered hairs; otherwise like the last species.

Plumbago zeylanica,

PLUMBAGINACEÆ.

F. B. I. iii. 480.

The Plains to 5,000 ft.
Giri and Sutlej Valleys
(Collett).

Koti.

Choa Saidan Shah.

Mator near Kahuta
(Douie).

Baluchistan (Boissier).

large, perennial, stems several, rambling, leaves 2-3 in., ovate, short-pointed, smooth abruptly, narrowed into the stalk, leaf-stalk $\frac{3}{4}$ in., stem-clasping, stipules round, flat, soon falling off; flowers $\frac{3}{4}$ in. long, bluish-white in bracteate, often branched, glandular spikes, 4-12 in. long, bracts in., ovate, short-pointed, calyx $\frac{1}{3}$ - $\frac{1}{2}$ by $\frac{1}{10}$ in., tubular, covered with stalked glands, 5-ribbed and toothed, teeth very short, corolla flat-topped, circular, tube $\frac{3}{4}$ in. long, lobes 5, $\frac{1}{3}$ in., nearly equal, round, spreading, stamens 5, free from the corolla, opposite the lobes, dilated at the base, anthers protruded, style 1; slender with 5 branches above; capsule thin, enclosed in the persistent calyx, opening transversely near the base, seed one.

PETALS NONE.

Polygonum orientale,

POLYGONACEÆ.

F. B. I. v. 30.

The Plains to 5,000 ft.
In swamps.

large, annual, velvety or silky-hairy, stems grooved, branches hollow-stemmed; leaves 6-9 by 2-5 in., ovate or ovate heart-shaped, long-pointed, grey with hairs, leaf-stalks 1-4 in., sometimes winged, stipules tubular, short, hairy, ending abruptly, mouth thin, papery, or dilated, green, curved back; flowers large, red, white or green, in crowded erect or drooping cylindric racemes 2-4

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

in. long, forming large terminal branched clusters, bracts hairy, ovate, flat, 3-6 flowers in the axil of each bract, calyx (perianth) of 4-5 segments, petals none, stamens 7 or 8, alternating with small honey secreting glands, enclosed in the calyx, styles 2, united half way up; nut round, $\frac{1}{3}$ in. diam., flattened with concave faces, coat very thick, black, shiny.

Polygonum virginianum,

POLYGONACEÆ.

F. B. I. v. 31.

Himalaya.

Kashmir.

Jhelum River 2-4,000ft.

Pir Panjal Range

7-10,500 ft. (Stewart).

large, perennial, rough hairy, branches hollow-stemmed; leaves 4-10 in., broad and tapering equally to either end, thin, leaf-stalk $\frac{1}{2}$ -1 in., stipules $\frac{1}{4}$ - $\frac{1}{2}$ in., tubular roughly hairy, mouth abrupt, bristly; flowers in very long slender long stalked racemes, 6-16 in., bracts tubular, bristly, $\frac{1}{4}$ -1 in. apart, 2-flowered, bracteoles narrow-transparent, calyx 4-fid, thin, stamens 5, alternating with glands, styles 2, long, stiff, hooked, persistent, stigmas undivided; nut oblong, with rounded ends, flattened, pale brown, as long as the persistent styles.

Polygonum glabrum,

POLYGONACEÆ.

F. B. I. v. 34.

The Plains to 6,000 ft.

Simla in ditches (Collett).

large, stem thick, often red, branched; leaves 4-8 in., lanceolate or linear-lanceolate with a fine long point, minutely glandular or not, stalked stipules $\frac{3}{4}$ in., tubular, smooth, thin, not fringed; flowers pink or white in slender erect racemes, 2-4 in. long, forming a terminal branched cluster, bracts smooth, tubular, tip oblong or rounded, calyx 5-fid, varying in size, stamens 6-8, styles 2 usually sometimes 3, united below the middle; nut rounded, bi-convex, 3-angled with 3 styled flowers, black, shining.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum lapathifolium,
or **simlense,**

POLYGONACEÆ.

F. B. I. v. 35.

The Plains to 7,000 ft.

Martiana, Theog (Collett).

Shahpur District

(Dowie).

medium-size, annual, branched, smooth below, rough with glands above; leaves 3-6 in., lanceolate finely pointed, narrowed to the base, glandular, leaf-stalk short, narrowly winged, upper leaves sessile, margins, midrib and nerves somewhat hairy, stipules tubular, not fringed; flowers red, $\frac{1}{8}$ - $\frac{1}{6}$ in. in dense-flowered, erect or nodding racemes, $1\frac{1}{4}$ -2 in. long, axillary, or forming terminal branching racemes, bracts tubular, short, not bristly, calyx 4-fid, glandular, stamens 6, styles 2, joined together close to the base; nut round, flattened, minutely dotted.

Polygonum persicaria,*Knot grass,*

POLYGONACEÆ.

F. B. I. v. 35.

Kashmir (Falconer).

Baluchistan (Lace).

very like the last species, but the leaves are without glands, stipules hairy, fringed, bracts bristly, flower stalks smooth, and calyx without glands.

Polygonum minus,

see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum stagninum,

POLYGONACEÆ.

F. B. I. v. 37.

The Plains.

small, branched or not, smooth below and hairy above; leaves 3-5 in., lanceolate or linear-lanceolate, long-pointed, velvety with flattened down hairs on both surfaces, glandular or not beneath, stipules tubular, with flattened down hairs, bristles shorter than the tube; flowers white in straight, erect, stout, or slender, long and strong stalked racemes, bracts enclose many flowers, rough with long bristles, calyx of 4-5 segments, without glands, stamens 5-8, styles 3; nut 3-angled, intensely black.

Polygonum barbatum,

POLYGONACEÆ.

F. B. I. v. 37.

The Plains.

very like the last species, but smoother, the stipules more bearded, the racemes long, weak and slender, the bristles of the bracts shorter and weaker.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

**Polygonum hydropiper,
Water-pepper.***Pani-maricha.*

POLYGONACEÆ.

F. B. I. v. 39.

The Plains to 7,000 ft.

Simla, Nal Dehra (Collett).

Hazara (Barrett).

medium-size, annual, stout, smooth, stems sometimes prostrate and rooting at the joints, often glandular, joints often swollen, branched; leaves 2-3 in., lanceolate or oblong-lanceolate, narrowed to the base, dotted with glands, midrib with minute hairs; stipules tubular, $\frac{1}{8}$ in., smooth or minutely hairy with flattened hairs, swollen out near the middle, fringed with short bristles; flowers pink or red in very slender drooping zigzag racemes, 2-3 in. long, with gaps along the raceme and leafy at the base, bracts smooth, with or without glands, tubular, mouth naked or minutely bristly, calyx of 5 segments, with glands, stamens 6, styles 2 or 3, ununited nearly to the base; nuts minutely dotted, in the 2-styled flowers circular and flattened in the 3-styled, 3-angled.

Polygonum flaccidum,

POLYGONACEÆ.

F. B. I. v. 39.

The Plains to 4,000 ft.

in wet places.

very like the last species, but larger with longer, broader, and more pointed leaves.

Polygonum glaciale,

POLYGONACEÆ.

F. B. I. v. 41.

Himalaya 8-12,000 ft.

Kashmir.

very small, annual, weak, smooth, nearly succulent, branches spreading from the root; leaves $\frac{1}{2}$ - $\frac{3}{4}$ in., broadly ovate, apex blunt, long stalked, winged above only, stipules short, smooth, cup-shaped, 2-lobed or not; flowers minute, white or pale purple in sessile or stalked heads $\frac{1}{8}$ - $\frac{1}{4}$ in. diam., stalk minutely glandular at the tip, bracts broadly ovate, blunt, smooth, flat, calyx 4-5 lobed, transparent, lobes nearly equal, blunt, stamens 5, no glands, styles 3, united; nut minute, closely included in the calyx-tube, black, striated.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum alatum,

POLYGONACEÆ.

F. B. I. v. 41.

The Plains from

2-10,000 ft.

Simla (Collett).

small to medium-size, annual, very variable, the smaller forms like the last species, but with short broad-winged leaf-stalks; leaves in the small form $\frac{1}{4}$ - $\frac{1}{2}$ in., in the large 1-3 in., broadly ovate, smooth, rarely hairy, blunt or short-pointed, abruptly or gradually narrowed into a broadly winged and sometimes eared leaf stalk, stipules tubular, hairy or glandular below, not fringed with bristles; flowers minute, white, purplish or red in heads, $\frac{1}{8}$ - $\frac{1}{2}$ in. diam., heads in the axils of leaves on stalks, glandular-hairy at the top, bracts flat, smooth, calyx 4-5-fid, stamens 6-8, style long with one or two arms, stigmas rounded; nut enclosed in the calyx, 3-angled, or flattened circular, minutely dotted.

Polygonum strigosum,

see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum sagittatum,

see Prostrate Herbs, Alternate, Stipulate, Simple.

Polygonum alpinum,

POLYGONACEÆ.

F. B. I. v. 49.

Himalaya 7-12,000 ft.

Kulu to Kashmir

(Thomson).

large, rootstock perennial, stem annual, grooved, pale, smooth or young parts softly velvety; leaves 3-5 in., lanceolate or linear-lanceolate, long-pointed, smooth, short stalked, stipules long, tubular, loose, upper part soon falling off, not bristly; flowers $\frac{1}{12}$ - $\frac{1}{6}$ in. diam., white or pale pink, numerous in terminal crowded broad pyramidal branching racemes, 12 in. long or more, bracts short, blunt, flower stalks much longer than the bracts, jointed close to or further from the flower, calyx 5-segmented, segments nearly divided to the base, inner segments broad tipped, stamens 8, rarely less, alternating with glands when present, styles 3; nut $\frac{1}{8}$ in. long, shining, pale, sharply 3-angled, longer than the calyx. Aitchison states that it is eaten raw and cooked, and tastes like rhubarb.

Polygonum polystachyum,

see Shrubs, Erect, Alternate, Stipulate, Simple.

Polygonum tortuosum,

see Shrubs, Erect, Alternate, Stipulate, Simple.

HERBS, ERECT, WITH ALTERNATE STIPULTE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Polygonum sibiricum,

POLYGONACEÆ.

F. B. I. v. 52.

Himalaya 11-12,000 ft.

Kangra (Edgeworth).

very small, perennially rooted, stem stout, branches many, spreading or erect; leaves 1-3 by $\frac{1}{10}$ - $\frac{1}{4}$ in., narrowly linear, blunt pointed, two processes sticking out at the base, leaf stalk thick, stipules tubular, short, thin and papery; flowers $\frac{1}{10}$ in. long, pink in heads. $\frac{3}{8}$ - $\frac{1}{2}$ in. diam., forming terminal branched racemes, shorter than the leaves bracts minute, flower stalks short or long calyx in five segments, segments broadly oblong, stamens 5-8, short, with or without alternating glands, styles 2-3; nut 3-angled, not tightly enclosed in the calyx, oblong-ovate, black, shining, equal in length to the calyx. This plant is eaten by the Thibetans.

Fagopyrum esculentum,
Buckwheat,*Phaphra, kultu, kathu.*

POLYGONACEÆ.

F. B. I. v. 55.

Himalaya 5-12,000 ft.

medium-size, annual, smooth, branched or not, cultivated and found as an escape; leaves 1-4 in. diam., triangular, heart-shaped at the base, short-pointed, stipules tubular; flowers small, white or pink in axillary or terminal heads forming stalked many-flowered cluster, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., calyx of 5 segments, segments nearly equal, stamens 8, alternating with yellow sessile glands, styles 3; nut $\frac{1}{4}$ - $\frac{1}{2}$ in., ovate with 3 sharp-angled, much longer than the calyx.

Fagopyrum cymosum,

POLYGONACEÆ.

F. B. I. v. 55.

Himalaya 5-11,000 ft.

Simla, in woods (Collett).

medium-size, root perennial, branched, slightly velvety; leaves 2-4 in. diam., broadly triangular, sharp-pointed, long stalked, upper leaves, narrower and stem-clasping; flowers white in racemes, 2-5 in. long, forming long stalked branching racemes, flower stalks jointed in the middle, otherwise like the last species.

Fagopyrum tataricum,*Ugal, kaspat.*

POLYGONACEÆ.

F. B. I. v. 55.

Himalaya 3-12,000 ft.

very like *Fagopyrum esculentum* above and also cultivated, but taller, and the faces of the nut deeply grooved with rounded angles.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Rumex nepalensis,**Dock,**

POLYGONACEÆ.

F. B. I. v. 60.

Himalaya 4-9,000 ft.

(12,000 ft. on the

Chenab, Stewart).

Simla (Collett).

Murree (Douie).

large, perennial sometimes, stout, branched; radical leaves 6-14 by 3-5 in., oblong, ovate-oblong or triangular-ovate, short-pointed or blunt, base broadly or narrowly heart-shaped and stalked, upper leaves not stalked and smaller, uppermost sessile and lanceolate, stipules tubular, not fringed soon disappearing; flowers small, green, often turning red, 2-sexual, in circular clusters at intervals along, nearly leafless racemes calyx of 6 circular sepals, 3 outer not enlarging, 3 inner enlarging in fruit, with a tubercle in the centre and fringed with hooked teeth, stamens 6, styles 3, stigmas fringed, terminal; nut brown sharply 3-angled, enclosed in the three enlarged hook-fringed and net-veined sepals.

Rumex hastatus,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Rumex acetosa,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Rumex vesicarius,**Bladder Dock, Sorret,***Katta mitha, saluni,*
chuka.

POLYGONACEÆ.

F. B. I. v. 61.

The Salt Range

Trans-Indus Hills.

Baluchistan (Hughes-

Buller).

small, annual, pale green, smooth, branches in pairs; leaves 1-3 in., ovate or oblong, base wedge shaped, rarely heart-shaped or terminating in two sharp angles, stipules tubular, not fringed, soon disappearing; flowers small, pink or white, male and female separate, in terminal short leaf opposed leafless racemes, 1-1½ in. long, flowers on jointed or unjointed stalks, calyx of 6 circular sepals, inner 3 much enlarged in fruit, thin, 2-lobed at each end, not fringed, stamens 6, styles 3, fringed, arising from the angles of the fruit, bent down; nut ½ in. diam., 3-angled.

Phyllanthus urinaria,*Huzur-mani.*

EUPHORBIACEÆ.

F. B. I. v. 293.

The Plains.

medium-size to large, annual, rarely perennial, smooth, stem and branches angled, angles of branches, margins of leaves and sepals often minutely hairy; leaves ½-¾ in., in two lines, overlapping, oblong or linear oblong, tip rounded or short-pointed, sessile, stipules target-shaped;

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

flowers minute, green, axillary, nearly sessile, males and females on the same plant, solitary or clustered, male flowers, calyx of 6 circular sepals, stamens 3, rarely 5, more or less united at the base, female flowers, calyx of 6 oblong sepals, styles 3, with two hooked arms; capsule $\frac{1}{10}$ in., prickly, hard, brittle with three 2-valved lobes, seeds transversely furrowed. This plant is said to be used as a diuretic and as a cure for jaundice.

Phyllanthus simplex,

see Shrubs, Alternate, Stipulate, Simple.

Phyllanthus niruri,

Sada, huzur-mani,
jaraula.

EUPHORBIACEÆ.

F. B. I. v. 298.

The Plains to 3,000 ft.

small to medium-size, annual, quite smooth, branched from the base, stem naked below, branches angular slender leafy; leaves $\frac{1}{4}$ - $\frac{3}{4}$ in., oblong or linear, tip rounded, blunt or sharp-pointed, thin, nearly sessile, pale green, often in two rows overlapping, bluish waxy gloss beneath stipules minute, awl-shaped; flowers green, very many, minute, shortly stalked, male flowers solitary, anthers 3, sessile on a short column, styles ununited, capsule round, hardly lobed, smooth, seeds with ribs and faint cross lines; otherwise like *Phyllanthus urinaria* (described above) and with the same medicinal properties.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Triumfetta pilosa,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Triumfetta rhomboidea,

Chikti,

TILIACEÆ.

F. B. I. i. 395.

The Plains to 5,000 ft.
Simla (Collett).
Koti.

medium-size to large, perennial, smooth, or velvety; leaves $2-3\frac{1}{2}$ by $1\frac{1}{2}-3$ in., broadly ovate, or 4-angled with the lateral angles blunt or heart-shaped, 3-7 nerved, apex short-pointed or 3-lobed, toothed, stipules ununited; flowers $\frac{1}{4}$ in., yellow in dense clusters, flower stalks short, buds oblong, club-shaped, pointed, sepals 5, oblong, concave pointed, petals 5, oblong, bristly at the base,

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

stamens 8-15, style thread-like, stigma 5-toothed; capsule $\frac{1}{4}$ in. diam., round or ovoid, white-felted, prickly, spines $\frac{1}{10}$ in., hooked, smooth, not dilated at the base, seeds one or two in each cell.

Triumfetta rotundifolia, see Shrubs, Alternate, Stipulate, Simple.

Triumfetta annua,
Chikti,

TILIACEÆ.

F. B. I. i. 396.

The Plains to 5,000 ft.
Simla (Collett).
Koti.

medium-size, annual, smooth except for a line of hairs on one side, which alters at every joint; leaves 4-5 by 2-3 in., ovate, long-pointed, toothed, smooth except for a few scattered hairs, long-stalked, stipules awl-shaped; flowers $\frac{1}{4}$ in., orange on stalks, 3-flowered, $\frac{1}{2}$ in. long, opposite to the leaves, sepals shortly and sharply pointed, petals nearly equal to the sepals, stamens 10; fruit $\frac{1}{4}$ in., bluish-green waxy gloss, 4-celled, spines long, smooth, hooked; otherwise like *Triumfetta rhomboidea*.

Corchorus capsularis,
Jute,

Harrava,

TILIACEÆ.

F. B. I. i. 397.

The Plains to 4,000 ft.
(Cultivated or escaped)
Thanesar (Edgeworth)

medium-size to large, annual, smooth; leaves 2-4 in., ovate-lanceolate, long-pointed, toothed, rounded at the base, the two teeth furthest back prolonged into tails, stalk $1\frac{1}{2}$ in., stipules thread-like, as long as the stalk; flowers small, $\frac{1}{2}$ in. diam. or less, yellow, one or two together on axillary or leaf opposed stalks, sepals 4-5, petals 4-5, without glands, stamens few or twice the number of petals, ununited, style short, stigma cup-shaped; capsule $\frac{1}{2}$ in. diam., nearly round, depressed at the apex, ridged, rough with hard tubercles, 5-celled, valves woody, without cross partitions, seeds few in each cell, brown, smooth, wedge-shaped. The fibre of the inner bark forms the jute of commerce.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Corchorus olitorius,
Jute, or Jew's mallow,
Banphal, koshta,
 TILIACEÆ.

F. B. I. i. 397.

The Plains to 4,000 ft.

very like the last species, but the sepals are short-pointed, petals longer than the sepals, capsule 2 in., cylindric, beaked, 10-ribbed, 3-6-valved, valves with cross partitions between the seeds, beak long, erect, undivided. This plant is cultivated as a pot herb and also for its fibre.

Corchorus trilocularis,
Kaunti,
 TILIACEÆ.

F. B. I. i. 397.

The Plains.

Phalia.

Gujrat Dist. (Douie).

Baluchistan (Lace.).

very like the last species, but is sometimes perennial and is indigenous, capsule 2-3 in., 3-4 valved, straight or curved, valves 3-4-angled, with partitions, rough, beak short, erect and undivided.

Corchorus fascicularis,
 TILIACEÆ.

F. B. I. i. 398.

The Plains.

very like the last species, but the leaves are usually smaller, flowers 2-5 on one stalk, capsule $\frac{1}{2}$ - $\frac{3}{4}$ in., 3 or 4 together, short, nearly cylindric, valves downy, almost without partitions, seeds 3-angled, black.

Corchorus tridens,
 TILIACEÆ.

F. B. I. i. 398.

The Plains.

Baluchistan (Boissier). abruptly cut off.

very like the last species, but the leaves are usually more linear, capsule 1-2 in., crowned by 3 spreading points with tufts of glandular hairs, valves without partitions, seeds with the ends abruptly cut off.

Corchorus acutangulus,
 TILIACEÆ.

F. B. I. i. 398.

The Plains to 5,000 ft.

Simla below 5,000 ft.

(Collett).

very like the last species, but with broader leaves, capsules 6-angled with three angles winged, crowned by three more horizontal spreading points valves with or without partitions.

Reinwardzia trigyna,

see Shrubs, Alternate, Stipulate, Simple.

Impatiens amplexicaulis,

see Herbs, Erect, Opposite, Stipulate, Simple, Toothed.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

***Impatiens scabrida*,**

GERANIACEÆ.

F. B. I. i. 472.

Himalaya 7-10,000 ft.

Simla, rare.

Mahasu, common

(Collett).

Murree (Douie).

large, annual, smooth or velvety, stems succulent, often much branched; leaves 2-6 in., ovate or lanceolate, long-pointed, toothed, teeth gland-tipped, sessile or narrowed into a short stalk, stipules of 2 large glands; flowers yellow, spotted with brown, $1\frac{1}{4}$ in. long without the spur, single on axillary, usually paired stalks, or on a common 2-6 flowered stalk, 1-2 in. long, stalk of each flower 1-2 in., bracts bristle-like, sepals 3, 2 lateral, minute greenish, one lower (lip) petal-like, coloured yellow, broadly funnel-shaped, abruptly contracted into a slender, cylindric, incurved hollow spur $\frac{1}{2}$ in. long, petals 3, one upper (standard) very large circular with a small green horn-like process on the back, two lower (wings) with lateral lobes, short, rounded, terminal, much smaller oblong, stamens 5, anthers cohering above the 5-toothed stigma with filaments clasping the ovary; capsule 1-2 in. long, linear, cylindrical tapering, straight, ribbed, smooth or nearly so, 5-valved, the ripe valves if shaken curl up elastically and jerk out the many, scarcely tubercled, oblong seeds.

***Impatiens amphorata*,**

GERANIACEÆ.

F. B. I. i. 475.

Himalaya, 5-8,000 ft.

Simla (Collett).

medium size, annual, smooth, slender or robust; leaves 3-6 in., lanceolate, round toothed, a bristle-like gland at the point of each rounded tooth, long-pointed, stalked, stipules of two sessile or stalked glands; flowers purple, $1-1\frac{1}{4}$ in. long less the spur, in racemes branched or not, or in umbel-like clusters, lip large deep broad, spur $\frac{1}{3}$ in., standard tip crested, wings white on the lower half; capsule $1-1\frac{1}{4}$ in., otherwise like the last species.

***Impatiens Edgeworthii*,**

GERANIACEÆ.

F. B. I. i. 476.

Kulu (Edgeworth).

very like the last species, but with yellow and red streaked flowers, bracts broader, lip funnel-shaped flower main stalks clustered, nearly terminal.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Impatiens racemosa

GERANIACEÆ.

F. B. I. i. 479.

Himalaya, 5-8,000 ft.

Simla, Fagu.

Narkanda (Collett).

large, annual, smooth, slender, branched; leaves 3-9 in., lanceolate or oblong-lanceolate, long-pointed, round-toothed, teeth or sinus gland-tipped, leaf stalk $\frac{1}{2}$ -2 in., slender, stipules of two sessile or stalked glands or none; flowers small, $\frac{1}{2}$ in. yellow in racemes or umbel like clusters, flower-stalks slender, $\frac{1}{3}$ in. long, bracts persistent, ovate, gland-pointed, two upper sepals ovate or oblong gland-pointed, lower (lip) boat-shaped narrowed into a slender tapering, nearly straight spur, $\frac{1}{3}$ in. long, upper petal (standard) not spurred nor winged, lateral petals (wings) darker spotted, with a long linear process descending into the spur; capsule $\frac{3}{8}$ - $\frac{3}{4}$ in.; for other characters see the last species.

***Impatiens laxiflora*,**

GERANIACEÆ.

F. B. I. i. 479.

Himalaya, 5-10,000 ft.

Simla, Hattu (Collett).

like the last species, but the leaves are usually smaller, leaf stalk longer, stipules always present, flowers slightly larger; lateral petals (wings) without the tail-like process, spur longer not straight, with clubbed tip.

***Impatiens micranthemum*,**

GERANIACEÆ.

F. B. I. i. 481.

Himalaya, 6-10,000 ft.

Simla (Edgeworth).

Hattu (Collett).

Changlagalli (Douie).

like the last species, but the winged leaf-stalks are prolonged down the stem, flowers white with red and yellow spots, much smaller, $\frac{1}{4}$ in. long, spur also $\frac{1}{4}$ in., straight.

***Impatiens brachycentra*,**

GERANIACEÆ.

F. B. I. i. 481.

Himalaya, 8-12,000 ft.

Murree (Fleming).

medium-size, stem not winged, slender, smooth, branched; leaves 2-5 in., ovate-lanceolate, round-toothed, teeth tipped with a glandular bristle, long-stalked, long-pointed; stipular glands often present; flowers $\frac{1}{4}$ in. long, white in racemes or umbel-like clusters in the axils of upper leaves, lip boat-shaped, spur minute or none, capsule narrow oblong $\frac{1}{2}$ in., nearly cylindric, tapering to a point; otherwise like the rest of this genus.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Psoralea corylifolia,
Babchi.

LEGUMINOSÆ.

F. B. I. ii. 103.

The Plains.

medium-size, annual, branches dotted with glands, leaves 1-3 in., roundish, with a widely round-toothed margin, firm, covered with black dots above and below; flowers $\frac{1}{2}$ in., yellow or white, tipped with purple, 10-30 crowded in long-stalked head-like clusters, calyx nearly sessile, bell-shaped, $\frac{1}{8}$ in., teeth 5, lanceolate, the lowest longest, corolla projecting a little beyond the calyx, lower petal keel-shaped blunt, tip slightly incurved, stamens 10, upper stamen united or not with the others in a tube, style long, thread-like, incurved; pod nearly round, small, smooth black.

PETALS UNITED.

Malvastrum tricuspidatum,

MALVACEÆ.

F. B. I. i. 321.

The Plains.

Lahore, Delhi,

Rawalpindi. (introduced).

medium-size, branched, covered with simple hairs; leaves 2 in., ovate-lanceolate, irregularly toothed, leaf stalk $1\frac{1}{4}$ in., stipules ununited; flowers yellow on axillary or terminal stalks, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, bracteoles 3, narrow, calyx bell-shaped, 5-lobed, triangular, short-pointed, petals 5, twisted, overlapping, longer than the sepals, stamens many, united below and to the petals, forming a tube, styles 8-12, stigmas round; fruit of 8-12 dry carpels, one-seeded, separating from the central column, curved with 3 projecting points.

Sida humilis,

see Prostrate Herbs, Alternate, Stipulate, Simple.

Sida spinosa,

Gulsakari, jangli-methi,

MALVACEÆ.

F. B. I. i. 323.

The Plains.

medium-size, perennial, shrubby, stems rough with star-shaped hairs, branches usually armed with curved spiny tubercle at the nodes below the leaf-stalks; leaves $\frac{1}{2}$ -2 in., very variable, ovate with or without a broad apex, apex blunt or notched, base heart-or wedge-shaped, grey below with star-shaped hairs, leaf-stalks $\frac{1}{2}$ in., stipules awl-shaped; flowers $\frac{1}{2}$ in. diam., white, on solitary or clustered stalks, jointed near the flower, equal to or longer

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

than the leaf-stalks, calyx tubular below, sepals 5, triangular, short-pointed, hairy, petals 5, united below and to the staminal tube, stamens many, united below into a tube; carpels 5, separating from the central column, crowned each by two long erect rough beaks, equal to the calyx, seeds one in each carpel. The roots and leaves are used in Indian medicine.

***Sida carpinifolia*,**

Bariara, kareta,

MALVACEÆ.

F. B. I. i. 323.

The Plains.

like the last species, but without spiny tubercles, leaves narrower, stipules broader, veined, bristly, flower stalks jointed near the middle, calyx-tube nearly round, petals twice as long as the calyx, yellow, carpels 5-10, wrinkled, beak of two bristles. Good fibre is obtained from the stems, and other parts are used medicinally.

***Sida rhombifolia*,**

Swet-berela, sahadabi,

MALVACEÆ.

F. B. I. i. 323.

The Plains.

Baluchistan (Lace).

like the last species, but larger, leaves squarer with rounded angles, and tapering at the base, flower-stalks longer than the leaf-stalks, stipules longer than the leaf-stalks, carpels 10, beaked with bristles or not, as long as the calyx.

***Sida cordifolia*,**

Kovar, Simak, bariara,

MALVACEÆ.

F. B. I. i. 324.

The Plains.

medium size, annual or perennial, downy with long hairs; leaves 1-2 in., oblong, heart-shaped, blunt-pointed, round-toothed, stalk equal in length to the blade, stipules linear, shorter than the leaf stalk, soon falling off; flower stalks solitary, upper very short and crowded, flowers small, yellow, carpels beaked with 10 bristles, netted on the sides, bristles longer than the sepals, covered with stiff reflexed hairs; in other respects like the last species. The flowers in this genus only expand at noon.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

Abutilon indicum,*Kanghi, Jhampi.*

MALVACEÆ.

F. B. I. i. 326.

The Plains.

Delhi.

Rawalpindi (Douie).

medium-size, annual or perennial, more or less downy; leaves 1-2 in. long, broadly heart-shaped, short-or long-pointed, coarsely toothed, or nearly entire, pale and minutely velvety on both surfaces, stalk longer than the blade, stipules sharply bent down; flowers 1 in. diam., yellow on axillary solitary stalks, longer than the leaf-stalks and jointed at the top, calyx tubular, 5-lobed, ovate with or without a hard sharp point, petals 5, spreading, stamens as in the genus *Sida* above; carpels 15-20, longer than the calyx, with short spreading bristle-pointed beaks, felted at first, afterwards nearly smooth, seeds one or more in each carpel, kidney-shaped, dark brown, covered with minute star-shaped hairs.

Abutilon bidentatum,

MALVACEÆ.

F. B. I. i. 326.

The Plains.

Baluchistan (Lace).

like the last species, but perennial, leaves $2\frac{1}{2}$ -3 by 2 in., heart-shaped ovate, long-pointed, round-toothed, downy above and below, stalks of lower leaves 4-5 in., stipules short, awl-shaped; flower stalks $1\frac{1}{2}$ -2 in., calyx-tube cup-shaped, lobes ovate, short-pointed; fruit $\frac{1}{2}$ in. diam., carpels 20, smooth, oblong, twice as long as the calyx.

Urena repanda,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus trionum,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus solandra,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus sabdariffa,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus abelmoschus,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Hibiscus cancellatus,

see Herbs, Erect, Alternate, Stipulate, Lobed.

Pentapetes phoenicea,

see Herbs, Erect, Alternate, Stipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE STIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS NONE.

- Ranunculus hirtellus**, see Herbs, Erect, Alternate, Exstipulate, Lobed.
Ranunculus sceleratus, see Herbs, Erect, Alternate, Exstipulate, Lobed.
Ranunculus lætus, see Herbs, Erect, Alternate, Exstipulate, Lobed.
Ranunculus arvensis, see Herbs, Erect, Alternate, Exstipulate, Lobed.
Girardinia heterophylla, see Herbs, Erect, Alternate, Stipulate, Lobed.

ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

- Reseda pruinosa**, see Herbs, Erect, Alternate, Stipulate, Simple, Entire.
- Triumfetta pilosa**, medium-size, perennial, branches covered with
Nichardi, soft star-shaped hairs; leaves 3-5 by 1-2 in., ovate,
 TILIACEÆ. lower leaves 3-lobed, toothed, covered with star-
 F. B. I. i. 394. shaped hairs on both sides, stalk $\frac{3}{4}$ in., hairy,
 The Plains to 5,000 ft. stipules awl-shaped, bristly, shorter than the leaf
 Simla (Collett). stalk; flowers $\frac{3}{4}$ in., yellow in axillary and leaf-
 opposed clusters, main flower stalks hairy, shorter
 than the leaf-stalks, minor flower stalks very short,
 very hairy, bract awl-shaped, hairy, sepals 5, linear
 bristle-pointed, petals 5, ovate-oblong, hairy at the
 base, stamens 10 or so, ununited, style thread-like,
 2-5 toothed; fruit $\frac{1}{2}$ in. diam. including the hairy
 hooked spines $\frac{1}{4}$ in. long, nearly round, 4-celled,
 seeds 8, round, dark-brown, flattened on one side.
- Triumfetta rhomboidea**, see Herbs, Erect, Alternate, Stipulate, Simple,
 Toothed.
- Corchorus acutangulus**, see Herbs, Erect, Alternate, Stipulate, Simple,
 Toothed.
- Geranium pratense**, see Herbs, Erect, Opposite, Stipulate, Lobed.
Geranium collinum, see Herbs, Erect, Opposite, Stipulate, Lobed.
Geranium palustre or see Herbs, Erect, Opposite, Stipulate, Lobed.
grandiflorum,
Geranium tuberaria, see Herbs, Erect, Opposite, Stipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNUNITED.

Peganum harmala,*Harmal,*

ZYGOPHYLLACEÆ.

F. B. I. i. 486.

The Plains to 5,000 ft.

Kashmir.

Baluchistan (Boissier).

medium-size, root perennial, stem and branches annual, bushy, smooth, pale-green, leaves 2-3 in., much divided, lobes or segments linear, short pointed, stipules bristle-like; flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., white, solitary, sessile or stalked in the axils of branches, sepals 4-5, linear, short-pointed, persistent, usually longer than the petals, petals 4-5, oblong, nearly equal, soon falling off, stamens 12-15, broad below, some without anthers, styles twisted, 2-3, keeled above; capsule $\frac{1}{5}$ - $\frac{1}{3}$ in. diam., depressed above, lobed, splitting into 3 valves, seeds many, angled. A red dye is obtained from the seeds and different parts of the plant are used in native medicine.

Lourea vesperilionis,

LEGUMINOSÆ.

F. B. I. ii. 154.

The Plains.

small, annual, slender, stems finely downy; leaves $\frac{3}{4}$ -1 in. long, 2-3 in. broad, divided into two equal lobes, linear, apex of each broadly notched and bristle-tipped, rarely one leaflet on each side making a compound leaf, side leaflets smaller, obliquely triangular with the point inwards; flowers $\frac{1}{4}$ - $\frac{3}{4}$ in., in simple or rarely branched racemes, 3-6 in., calyx $\frac{1}{4}$ in., bell-shaped, teeth lanceolate equal to the calyx-tube, petals 5, standard broad, keel blunt, stamens 10, not all united, style thread-like, incurved; pod smooth, veined, joints 4-5, and each one seeded, all included in the enlarged calyx.

Spiræa vestita,

ROSACEÆ.

F. B. I. ii. 323.

Himalaya, 7-12,000 ft.

Kashmir.

Hattu (Collett).

medium size, shrubby, root perennial, stems velvety, very like Meadow Sweet, *Spiræa Ulmaria*; leaves 2-12 in., irregularly divided into lobes, lateral lobes few or many, sharply toothed, small, or one or two pairs $1\frac{1}{2}$ in. long, terminal lobe 2-6 in. diam., deeply cut into three to five sharply toothed, long-pointed segments, upper surface smooth, lower white-felted, stipules half circular, large, sharply toothed, persistent; flowers $\frac{1}{4}$ in. diam., white in large oblong much branched terminal clusters, calyx 4-5-lobed, very small, lobes blunt, persistent, petals 4-5-oblong-rounded, stamens many, styles many, nearly terminal; carpels many, ununited, woolly, 2 seeded.

THE PROGRESS OF THE MAMMAL SURVEY.

IN the beginning of March, the Society's Collector, Mr. C. A. Crump, was sent to East Kandesh. Arriving at Jalgaon on March 5th, he remained there for five days and did some trapping in the vicinity of the town. Nothing of any special interest was obtained, but a fox was seen which appeared to be larger than the Indian fox (*Vulpes bengalensis*)* and had a white tip to its tail. Apparently this must have been the Desert Fox (*V. leucopus*), a species according to Blanford confined to the drier districts of Sind, Rajputana and the Punjab.

From Jalgaon a move was made S. W. to Parola, where Mr. Crump went into camp with Mr. A. H. Simcox, I.C.S., from whom he received much assistance. The country round Parola, being mostly cultivated with patches of scrub jungle here and there, was not very productive of specimens, and so, after a short stay, a move was made on to Bhadgaon on the G. I. P. Railway line and from there on to Shendurni, arriving at the latter place on March 30th. Round Shendurni there is extensive cultivation of betel leaf (*Piper betle*) in small gardens surrounded by grass "tattis," sometimes about 15 feet high. The gardens are irrigated and make cool retreats for jackals and cats during the day-time. The cats (*Felis chaus*) are very destructive to poultry in these districts and frequently carry off fowls, before it is dark, within sight of the owner. The mungoose does not appear to be common in this part of Kandesh, and hyænas were not met with nor were their tracks observed. Leaving Shendurni a short trip was made across the Kandesh border to Fardapur and from there one day was spent in visiting the Ajanta Caves to obtain bats. Thousands of bats were found to inhabit the caves, but only two species of sheath-tailed bats were obtained, and no young were seen. Both sexes were found in the same cave, but, as a rule, the species were not mixed. The species were *Taphozous melanopogon* and *T. kachhensis* or a species closely allied to it. From Fardapur, camp was moved back into Kandesh at Jamner, but as the country was very similar to that which had already been visited, a move was made to Ghodasgaon, where the country changes considerably. The Girna river separates the forest land from the cultivated, the

* All scientific names mentioned are merely provisional as the specimens have not been worked out at the British Museum.

former stretching to the range which divides Kandesh and Nimar. The jungle was rather open, but large numbers of Pea-fowl were to be found. The forests being closed, cheetal were to be seen in large numbers, and they were very tame. Many were noticed drinking about 10 a.m. and between 6 and 8 p.m. Sambur, too, are plentiful, and appear to drink much later than cheetal generally between 10 and 12 p.m. Nilgai, which were very common, were noticed drinking at all hours of the night, but more especially between 8 and 10 p.m. Chinkara were seen drinking about mid-day, and pigs, which were plentiful, appeared to drink just about the darkening. Many porcupines' earths were found, but near Ghodasgaon they had been smoked out by some wandering tribes. It was noted that most of the porcupine earths had four or five entrances, two or three being much larger than the remainder, and that the remains of many chewed sambur and cheetal horns were to be found lying about in the vicinity.

Mole rats being difficult to trap here, though their workings were much in evidence, a large number were obtained by digging out their burrows. A few small rodents, a couple of hyænas, a jackal and some bats were obtained at Ghodasgaon, but no monkeys were seen, and the natives say they do not visit that part of the country till after the rains in September.

A move being made to the railway line, train was taken to Amraoti, and from thence Mr. Crump worked up to Chikalda and down the Sipna valley to the Tapti river returning to the railway again at Malkapur on account of the approach of the monsoon. Chikalda is about 3,600 ft. above sea-level, and is surrounded by heavy jungle in which sambar, muntjac, four-horned antelope, pig, panther and an occasional tiger are to be found. A hare similar in appearance to *Lepus nigricollis* is not uncommon, but no mungooses were seen, and they were reported as unknown so high up. The langur, *Presbytis entellus*, or a rather more brightly coloured race, is very common, but strange to say was difficult to approach. The small Bengal monkeys are said to frequent the fort, but only one was seen, and all endeavours to come across more were of no avail. A number of mice and rats were caught in the ruins of the Fort and a few palm squirrels were seen, but they were not at all common. No flying squirrels or large Indian squirrels were seen and they are said not to be found there. The results of the Chikalda

visit are, it must be confessed, disappointing, as it was expected that a hill of some 3600 feet would have yielded a rather different fauna to the surrounding country as is the case with Matheran.

Leaving Chikalda a move was made north to Sembadoh in the Sipna valley. Fine heavy jungle is found round here, and in the river there are some good pools. Flying squirrels were fairly plentiful, but on only one occasion were they seen before dark. As they sail through the air, they make a sort of swishing sound which ends as they alight on a tree stem with a noise described as similar to that produced by swinging a piece of sacking against a wall. While following the tracks of a wounded bear three wild dogs, two adults and one puppy, were seen and two were obtained. A few rats and mice were caught and several muntjac and four-horned antelope were shot.

The total number of skins obtained in Kandesh and the Berars was about 150, besides one or two birds and a few invertebrates.

Since the last Journal was published, a further sum of Rs. 10,032 has been subscribed, making the total now some Rs. 20,816. This is not yet however enough to carry out the survey as proposed, and we hope members who have not already subscribed will see their way to do so. The Military Secretary to H. E. the Viceroy has written and informed the Honorary Secretaries that His Excellency "thoroughly approves of the scheme the Bombay Natural History Society is attempting to carry out, and hopes that the results will be successful;" and many people at home, including H. R. H. the Duke of Connaught, have shown their interest in the scheme by sending subscriptions. It has been decided to bring out a second collector, as to cover all India, Burma and Ceylon would take one collector a very long time. The services of Mr. Shortridge have been secured, and he is expected out here shortly, and he will at once start to work Southern India starting at Dharwar. In Mr. Shortridge, the Society have secured a highly trained collector with plenty of experience of tropical and subtropical countries. Mr. Shortridge only a short time ago returned from the British Ornithologists Union Expedition to New Guinea, and before that had done extensive collecting for the British Museum in Java and Northern Australia, through the generosity of Mr. Balston.

2nd September 1911.

MAMMAL FUND.

LIST OF SUBSCRIBERS.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged	10,908	15	0
Anderson, Mrs. J.	200	0	0
Andrews, G. P.	15	0	0
Ash, H. D.	30	0	0
Baroda, H. H. Sayajirao, Gaikwad of	500	0	0
Battie, J. S.	10	0	0
Beadon, W. R. C.	10	0	0
Beg, Mirza Nazir	10	0	0
Bell, E. N.	15	0	0
Bennett, H. C.	15	0	0
Blathwayt, C. H.	30	0	0
Boyd, Capt. J. E.	15	0	0
Bridgeman, Hon. Mr. H. G. O.	25	0	0
Briscoe, W. F.	15	0	0
Burton, Major R. W.	15	0	0
Carmichael, G.	30	0	0
Carter, Major J. B.	25	0	0
Chico, J. R.	25	0	0
Chitty, the Hon. Mr. Justice C. W.	30	0	0
Congreve, C. R. T.	20	0	0
Cosens, Lt. G. P.	50	0	0
Cox, Lt.-Col. P. Z.	100	0	0
Cruikshank, W. D.	20	0	0
Dhar, H. H. the Raja of	500	0	0
Donald, C. H.	50	0	0
Dumayne, Sir F. G.	10	0	0
Dunbar-Brander, A. A.	10	0	0
Dunn, C. W.	15	0	0
Ellis, E. V.	30	0	0
Enthoven, R. E.	20	0	0
Fenton, Lt.-Col. L. L.	25	0	0
Fletcher, T. Bainbrigge	10	0	0
Gallie, H. H.	25	0	0
Gaye, W. C.	10	0	0
Gibbon, M. C.	20	0	0
Gore, F. W.	5	0	0
Gough, Major H.	25	0	0
Gregson, Capt. C. D.	30	0	0
Harter, R. W.	30	0	0
Harvey, Major W. F.	30	0	0
Hawley, Capt. W. G. B.	15	0	0
Hayden, H. H.	20	0	0
Howell, E. B.	15	0	0
Carried over	13,008	15	0

NAME.	Amount.		
	Rs.	A.	P.
Brought forward ..	13,008	15	0
Hudson, C.	15	0	0
Hyam, Judah	10	0	0
Hyderabad, H. H. the Nizam of	2,500	0	0
Idar, H. H. the Maharaja of	200	0	0
Inman, Capt. H. M.	15	0	0
Inverarity, J. D.	100	0	0
Ivens, J. H. A.	10	0	0
Jacob, W. R. M.	10	0	0
Jardine, W. E.	50	0	0
Jeddere-Fisher, H. C.	50	0	0
Julius, V. A.	20	0	0
Kemball, H. V.	100	0	0
Kerr, Dr. A. F. G.	20	0	0
Kerr, Nigel	10	0	0
Kotawalla, Seth Keshrising	100	0	0
Kurundwad, Chief of (Senior)	75	0	0
Lace, J. H.	25	0	0
Lamington, Lord	15	0	0
Lloyd, Capt. R. E.	20	0	0
Logan, R. O.	20	0	0
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Lowsley, C. O.	10	0	0
Luard, Major C. E.	50	0	0
Macrae, Major J. L.	10	0	0
Macwatt, Lt.-Col. R. C.	15	0	0
Macwood, F. M.	100	0	0
Martindelle, H. E.	20	0	0
Maxwell, R. M.	25	0	0
Mead, P. J.	25	0	0
Mears, Major A.	10	0	0
Mess President, 122nd Infantry, Quetta ..	30	0	0
McDiarmid, K.	10	0	0
Millet, G. P.	20	0	0
Milward, R. C.	100	0	0
Mitchell, H. H. G.	50	0	0
Moule, Capt. H. E.	25	0	0
Mullen, J. P.	10	0	0
Newnham, Lt.-Col. A.	25	0	0
Northcote, Lord	150	0	0
Ormiston, W.	20	0	0
Peters, Lt.-Col. C. T.	15	0	0
Pollard, Capt. A. E. St. V.	30	0	0
Pope, J. A.	20	0	0
Purkis, F. C.	10	0	0
Reay, Lord	100	0	0
Rogers, C. G.	25	0	0
Carried over ..	17,803	15	0

NAME.			Amount.		
			Rs.	A.	P.
Brought forward ..			17,303	15	0
Saunders, Major F. W.	..	..	15	0	0
Sedgwick, L. J.	..	..	10	0	0
Sharp, Hon. Mr. W. H.	..	..	20	0	0
Shipp, W. E.	..	..	10	0	0
Simonds, Capt. M. H.	..	..	15	0	0
Simpson, J. Hope	..	..	32	0	0
Sinclair, R. L.	..	..	25	0	0
Skinner, R. R.	..	..	10	0	0
Smales, C. B.	..	..	25	0	0
Spence, R. A.	..	..	20	0	0
Stephens, L. B.	..	..	25	0	0
Sullivan, Col. G. D. F.	..	..	30	0	0
Suter, Dr. M. F.	..	..	40	0	0
Symes, W. C.	..	..	15	0	0
Tata, R. J.	..	..	1,000	0	0
Tenison, W. P.	..	..	15	0	0
Tomkins, Major E.	..	..	20	0	0
Troup, R. S.	..	..	10	0	0
Tweedie, A. G.	..	..	25	0	0
Tytler, Lt.-Col. H. C.	..	..	15	0	0
Wall, Major F.	10	0	0
Wilson, Lt.-Col. C. H. L. F.	25	0	0
Willock, Commander A. R. G.	15	0	0
Worgan, Capt. R. B.	10	0	0
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			£	s.	
Bailward, Col. A. C.	2	0	
Beddome, Mrs.	1	1	
British Museum Natural History.	100	0	
Connaught, H. R. H. the Duke of.	3	0	
Cook, Charles	..	..	5	0	
David, Charles	..	..	3	3	
Gladstone, H. S.	..	..	1	0	
Poncins, Baron Edmund de	..	..	2	0	
P. Spicer & Sons	..	..	1	1	
Pym, Francis	..	..	6	13	
Stables, Major Alex	..	..	2	2	
Turner, Rowland E.	..	..	2	0	
Tweedy, Sir John	..	..	5	0	
Ward, Rowland	..	..	5	0	
Total	..	..	139	0 = Rs.	
			Total ..	20,816	2 0

MISCELLANEOUS NOTES.

No. I.—TIGER CALLING LIKE A SAMBUR.

Mr. Seton-Karr's interesting account of hearing a sambur 'belling' in close proximity of tigers is very like an experience of mine.

Once at Kamaing in the Myitkyina District, I got kubbar late in the afternoon that some tigers, said to be a tigress and cubs, had got into a herd of cattle and had killed and mauled a lot of them. I immediately went out and found that four or five had been killed. I had the carcasses dragged near the only tree, which was unfortunately a bare dead one, and had a machan built and spent the night in it. Soon after dark I heard the tigers moving round in the half burnt elephant grass, but they would not come to the "kill". After a time I heard one calling to my right in the direction of the village, shortly after that I heard a sharp "Sambur-like" call to my right and slightly behind me; I heard this call at least three times. A little later I heard an unfortunate cow cry out; I heard it killed and the tigers feeding, (this kill was within 100 yards of my tree). This cow must have been mauled in the afternoon and left behind when the others were driven in. Now this "Sambur-like call" may of course have been a sambur, but the spot was near a village and must have been very disturbed in the afternoon, and so would have been a most unlikely place for a sambur.

In Burma it is a well known fact that tigers often call like a sambur, this is called by the Burmese "Tit" ing. The above is not the only time I have heard this calling; on two or three other occasions I have heard exactly the same call and been informed by the shikaries that it was a tiger.

I know several other men in Burma who have also heard the same call. In Mr. Seton-Karr's account he does not say he actually saw the sambur, so most probably the call he heard was one of the tigers calling to the other.

H. H. HARRINGTON, MAJOR.

MANDALAY, 14th June 1911.

In the Miscellaneous Notes of the last issue of your Journal there is included an account of the behaviour of a sambur (*Cervus unicolor*) in the presence of tigers near a kill.

Mr. Seton-Karr does not say that he actually saw the sambur hind but he states that he heard "the sharp clarion call of a sambur hind" and ends his note with a query "why did the tigers not molest her?" I think the probable answer is that there was no sambur hind to be molested and that what the writer thought was a sambur hind was in reality one of the two tigers which he ultimately saw.

A tiger frequently makes a noise similar to but slightly higher in tone than that of a sambur. When I first heard this noise and was told by local jungle people that it was a tiger, I did not believe it, but have since had proof that a tiger does make such a noise. On one occasion I actually saw a tigress when making a noise which I at first thought to come from a sambur.

The two calls are so similar that even local jungle people cannot always say whether it is a sambur or a tiger calling, and it is easy to understand that even so experienced a shikari as Mr. Seton-Karr might be taken in.

JAMES W. BEST, I.F.S.

CAMP BILASPUR, C. P.

29th May 1911.

NO. II.—YOUNG TIGER ATTACKING HUMAN BEINGS.

At 11-30 P.M. one night in the middle of February some villagers came and said a tiger had killed a man and woman in their house and was still in the house and asked me to come and kill it. I thought the story was rather queer and, although it was about 5 miles away, I decided to go.

When I got there I found an old woman and a man about 40 years of age had been badly mauled but were not dead. The door of the hut in which the tiger was said to be was nearly closed and a big fire lit in front of it. The hut consisted of four stone walls of about 4 feet and a kutchra grass roof.

I walked round the three walls but could hear nothing and thought it was a fairy tale that the tiger was inside. On asking what size the tiger was "oh bahut bahut burra walla" I was informed. Approaching carefully towards the door I was greeted by a growl from inside which sounded as if it came from a large animal. I got a hole made in the roof, big enough to let my lantern down and then made another low down in the wall.

After looking for a long time I saw the tiger crouched very close to the ground behind a basket. He appeared big and I let him have 8 bullets. He never uttered a sound after the first shot, but his position was not altered, so I did not know whether he was shamming and therefore let him have the others. I was rather sick to find when he was brought out that he was only a cub measuring six feet, but it was a lesson as it only shows what a cub can do. The animal had followed the goats into the house and had attacked the man and woman, but they scrambled through the door which closed after them. They are in hospital here, and are in rather a bad state, the man has a broken arm and a number of wounds and the old woman is covered with wounds, and it will be touch and go whether she will pull through.

MUKTESAR, 26th February 1911.

H. E. CROSS.

No. III.—PANTHER AND WILD BOAR.

A rather curious incident occurred to me the other day in a jungle in this district. I was sitting up over a goat, having seen signs of two panthers (*F. pardus*) in the vicinity.

At about 1 A.M. a panther killed the goat, but the moon had set and it was too dark to see it, though the black body of the goat was faintly visible.

Whilst the panther was eating the goat, another animal walked up to the kill and stood about a yard or two from it looking on. The sound of tearing and crunching did not stop for an instant, and I came to the conclusion that this must be the other panther whose tracks I had seen.

After a minute or two this animal came towards the foot of my tree and it was discernible against the whitish grass, I took a shot and brought it down. It turned out to be a big boar (*Sus indicus*).

It was apparently in no way disconcerted by the operations of the panther upon the goat, and the panther cared so little for the presence of the boar that he never even paused in his meal whilst it walked up to within two yards.

F. FITZ-GIBBON, LIEUT.

JUBBULPORE, 22nd April, 1911.

No. IV.—GOLDEN CAT, *FELIS TEMMINCKI*, KILLING
BUFFALO CALF.

Through the kindness of Mr. T. Rennie, of the Civil Veterinary Department, the Society has received a skin of a Golden Cat killed in Tennasserim. In forwarding the skin Mr. Rennie writes that it was sent to him by Mr. G. P. Andrew, I. C. S., Deputy Commissioner of Mergui, and quotes an extract from his letter. As very little is known of the habits of this cat it is worthwhile putting on record Mr. Andrew's remarks which are as follows:—

“The skin of an animal which was speared near Victoria Point by some Malays after it had killed a buffalo calf. I am quite unable to identify the animal, the Burmans, who in such matters are uncritical, call the animal a “Cha-Ni” the Malay word is “Ri-mao bang sa marah” the Siamese word is “Hau pan deng”. But I gather that all these expressions simply mean a tiger (or panther) of a reddish or tawny colour”.

BOMBAY.

N. B. KINNEAR.

No. V.—MUNGOOSES IN THE EASTERN GHATS.

Whilst camping this month on Horselykonda, I saw specimens of *Herpestes auropunctatus*, *Herpestes smithi*, and *Herpestes vitticollis*. Horselykonda is a small peak in the Eastern Ghats which runs up to 4,000 feet in

height and is situated on the borders of Mysore in the Madanapalle taluk of the new Chittoor District of the Madras Presidency. The peak is well forested and there was nothing peculiar in finding the Ruddy Mongoose (*H. smithi*) there as it has a very wide range in the Peninsular. The specimen I saw was a peculiarly fine one. It is however not a little remarkable that the small Indian Mongoose (*H. auropunctatus*) should occur there as according to Blanford it is only found in Northern India, not further South, in the Eastern portion than Midnapur. I saw it in the verandah of the bungalow in which I was residing running along the bottom of a palmyra bressumer. It seemed quite accustomed to this inverted position about which, perhaps, there is nothing remarkable in a member of the mongoose family, but which immediately rivetted my attention. It stopped just in front of the door of the room I was in and gave me an excellent view. It was altogether unmistakable and I am quite satisfied as to the species, but I regret to say I was unable to secure it. I saw the striped neck Mongoose (*H. vitticollis*) during a morning walk in the jungle and did not happen to have a gun in my hand at the time. I happen to know the species having seen it before on the Western Ghats.

I am aware that this evidence will be found insufficient to be acceptable to the Society without the accompaniment of skulls and skins, but it struck me that were the matter brought to the notice of readers of the Journal it might induce some few to make closer observations. I think it very likely that the small mongoose may be found on the hills of the Ganjam, Vizagapatam and Salem Districts as well as in Mysore, whereas the striped neck mongoose may be found in Mysore and Salem, and I would suggest these as fields for closer observation.

BELLARY, 27th May 1911.

P. ROSCOE ALLEN.

[We have certainly never heard of *H. auropunctatus* so far south before. These notes of Mr. Roscoe Allen's emphasize the great necessity for the Survey of Mammals which the Society has undertaken—Eds.]

NO. VI.—DISTRIBUTION OF THE SLOTH-BEAR (*MELURUS*
URSINUS), AND THE INDIAN LION (*FELIS LEO*).

In reference to the note by Col. Fenton in Vol. XX, No. 1, at page 213, of the Society's Journal, it is perhaps worth recording that there are at present no bears in Kutch, nor have I heard of any having ever existed here before.

As to the Gir Country being suitable for bears, I was told by Hebat, the Junagadh Shikari, who must be well known to all sportsmen who have shot in that State, that a couple of bears were some time ago let loose in the Gir forest, but that they did not long survive, having died from the effects of swallowing certain wild fruits.

As to lions, they probably did occur in Kutch, not very long—about 80 or 85 years ago. It has been stated in some books on Sport and Natural History that they were found in Kutch and there are different spots in the Province known by such names as “Lion’s Hill,” “Lion’s Cave,” etc. Also some of the old inhabitants assert that they have heard of instances, though rare, of lions having been met with in former times. I questioned an old Rajput, whom I saw in the districts and who had been keen on shikar in the days of his youth, if he had seen a Lion. This man replied that he never saw one himself but that he had known people who had. So, on the whole, there appears to be sufficient evidence to conclude that lions did occur in Kutch at one time, as they did in Gujarat and in other parts of Kathiawar, besides the Gir. In Kutch the common term “Sinh” is used for both the lion as well as the tiger, but it is more probable that the animals which, there is reason to believe, existed in Kutch were lions than that they were tigers.

R. K.

BHUJ, 10th March 1911.

P. S.—After I sent my note, dated the 10th March last, my attention has been drawn by Mr. J. H. Smith to the following note in a book (Memoir on the Geology of Kutch).

“Lieutenant Dodd says that Burns, writing in or about the year 1830, mentioned lions, bears, tigers and wolves as to be found north of Bhooj, none except the latter being now visible; but that a solitary lion was shot on the Runn near Bela, supposed to have wandered from Kattiwar.”

R. K.

BHUJ, 17th July 1911.

NO. VII.—THE BIRTH OF A WILD ELEPHANT CALF.

On Christmas day 1910 my camp was at Kyoukpazat on the Phatashin stream in the Henzada District. Mr. E. V. Ellis, Deputy Conservator of Forests, had come over to spend the Christmas holidays with us and to do a little shooting. During the early hours of the morning we heard wild elephants trumpeting and making a great noise up the Phatashin stream and not more than a mile or so from camp, and when we started the first beat of the morning the elephants were in a little valley just below the spur on which the guns were posted. The beat proved a blank, for nothing came out, and although the beaters made a fiendish noise the elephants did not make off. The next beat was on the next spur and again the elephants were just behind us. This beat was also a blank. Whilst the beat was coming along I noticed that the beaters seemed very excited and kept on saying to one another “let’s catch it after the beat.” So

when they got up to us, I asked what the excitement was about. They then told me that an elephant had given birth to a calf in the stream and they wanted to catch the calf, presumably to kill and eat. But as a young calf was caught and brought to me the year before from a place not four miles from this place, presumably of this very herd, and as I had a deal of bother over it, not being able to get sufficient milk to feed it on although I had bought two cows to supply it with milk. I did not feel like being saddled with another calf, so told the men that they were not to catch it. I then told them to take us to the place where the birth took place. This was in the bed of the Phatashin stream close by, and we soon got to the spot. The elephant had selected a soft spot in the bed of the stream and close to the water and dropped her calf there. The ground was a bit cut up and the Burmans went poking about and soon unearthed a small bag full of water. After this they crossed the stream which was only a couple of yards wide (the water part) and dug about in another place where the ground was turned up, and soon produced another bag, the "after-birth" (achin) which was buried about a foot deep in the sand and pebbles. The Burmans were highly delighted at the find, so I naturally asked them what they were going to do with it, to which they replied "why, eat it of course." They soon had the "after-birth" washed and tied up in their sheets and were ready to go home and start cooking it, but we were not done with the beating, so went on and had two or three more beats in which we got a barking deer and a great big wild boar which they said had killed a man on the very spur we got it on not two months before. The man who was killed had followed up the boar from the paddy fields and had wounded it with an arrow shot from a cross-bow and on following it up, the boar charged him. He tried to climb a tree but the boar was too quick for him and ripped him badly and he died of the wounds after a few days.

Talking of the parturition of elephants, Lieut.-Colonel G. H. Evans, Superintendent of the Civil Veterinary Department of Burma, in his Treatise on Elephants, *Elephants and their Diseases*, notes on page 96 that an elephant gave birth to a calf at Pazundaung near Rangoon and that the Burman attendant stated that the dam ate the "after-birth." I wonder if this happens only in the domesticated state or whether wild elephants eat it too. In the case noted by me the dam certainly did not eat the "after-birth" for we found it intact. I have often noticed that domesticated goats, cows, buffaloes and sheep eat the "after-birth." I would be glad if some one would explain the reason of this to me. Does the dam eat it to clear herself?

C. W. ALLAN,

HENZADA, BURMA, 26th March 1911.

Divisional Forest Officer.

No. VIII.—NOTES ON THE GAUR (*BOS GAURUS*).

In September 1905 Mr. Aylmer Martin delivered a lecture before the members of the High Range Natural History Society on the Gaur (*Bos gaurus*). Mr. Martin has kindly forwarded the MS. of this lecture to us and has allowed us to make extracts from it.

Writing of the colour of the head and body Mr. Martin says:—

“As regards colour, the hair on the forehead and frontal ridge of a specimen we had alive under almost daily observation at Sothapara for $4\frac{1}{2}$ months was slaty grey, black down the front and sides of the face; the muzzle large and dark slately grey in colour. The greatest spread of the horns of this specimen was $34\frac{1}{2}$ inches.

There are many different shades of colour in a bison's horns, at the base a dull slate, giving way, a little further up, to a yellowish tint, which again turns into a dull greenish colour, getting darker towards the tips, which are always quite black. The ears are larger in proportion to the head than those of domestic oxen, and black outside, the rich yellow skin of the inside showing through ridges of black hair. The eye has been much discussed and has mostly been described from dead beasts. The Sothapara specimen we were careful to make note of, the iris of his eye was a mottled light brown, and pupils a slaty blue.

He stood 16 hands $1\frac{1}{2}$ inches at the shoulder. His body colour slaty grey on the dorsal ridge deepening through shades of brown to intense black on the sides and shoulders, coffee-brown on the hind quarters, turning gradually to black on the flanks. The hoofs were white, and the legs white from 2 inches above the knees and hocks *outside* and from 1 inch above the knees and hocks on the *inside* of his legs.

The hair inside the thighs and armpits was a bright chesnut. The neck was black and had a large dewlap hanging down to a little below the level of his knees. I give this description from notes I took from the live mature animal at the time, and having since examined several bison shot by myself and others I find that it is accurate enough to pass for them all. Nevertheless, it contradicts in important particulars the description given by many well known authorities.”

In regard to the presence and absence of dewlap, colour of eye, &c., about which there has from time to time been much discussion, Mr. Martin writes:—

“Sanderson wrote in 1879 his ‘Thirteen years among the Wild Beasts of India,’ a charming work full of truth and beauty; he is silent on the dewlap question, but differs from my description in other respects. Mr. Edward Kindersley, who has shot bison on these hills and elsewhere, wrote in November 1893 to the *Nilgiri News*—‘I have never to my knowledge shot a dewlapped bison,’ while Mr. A. W. Turner, whose knowledge

of game on these hills has never been approached, much less equalled, told me that all bison had dewlaps. These diametrically opposed observations led me to suspect that there might be two varieties of the animal, one with and the other without dewlaps, and this idea was strongly confirmed, when I found to my surprise that the Muduvars on these hills recognised both varieties and had a different name for each, one meaning 'Cow Cattle' and the other 'Buffalo Cattle.' They even speak of herds living apart and occupying different parts of the country. Still, the difficulties in the way of accepting finally, and as a fact, that two different varieties exist in such close proximity without intermixing, are so great that I cannot say that my mind is made up on the subject. I must give you just a couple more references. Long after the question was mooted Mr. C. E. M. Russell wrote a book in 1910, called 'Bullet and Shot,' in which he says:—'*Although, as a rule, a Bison has no dewlap, the first bull I ever bagged had a well-defined one. Capt. (now Col.) W. (late of the 43rd O. L. I.) who was with me, and who had shot a very large number of Bison was greatly struck by the dewlap carried by this animal, a solitary bull with a very fair head, and he called my attention to it.*'

Mr. Stuart Baker, in an article well worth study, which he contributed to the Journal of the Bombay Natural History Society, Vol. XV, No. 2, says on page 236, that he considers the dewlap merely an individual characteristic, and while this may be true, it will be curious if we find that other characteristics always accompany the dewlap, such as, for instance, the shape of the horns, and the ram-nosed profile of the face.

I have dwelt a long time on the subject of the dewlap, because it is not yet a settled question, and the accepted authorities have still to be put right in the matter. More particularly it should be noted if dewlapped bison are ram-nosed, and those without dewlaps straight-nosed, and if there is any difference in the shape of the horns, or in the breadth of the skull. Bison should be carefully observed with the telescope, and when possible with the unassisted eye, before stalking or shooting them, because the way a beast falls makes it sometimes difficult to see whether the dewlap is present or not.

Another much disputed point is the colour of the eye, query, does it vary? And the 'white stocking' has been incorrectly observed by Sanderson and others. Sanderson indeed makes two mistakes in one sentence, he writes 'the legs *below* the knee downwards, as also the forehead, are of a dirty white colour,' and the beautiful illustrations in his book bear out these wrong descriptions; the white stocking commences from above the knees as I have already told you, and the forehead is not of the same colour at all. As regards the size of heads, which will interest sportsmen more than others, I will not say much because I have

written all I know on the subject to Mr. Koechlin, and perhaps it will appear in connection with the game register he is keeping.

The measurements of the largest pair of horns of *Gavaeus gaurus* in the possession of the Bombay Natural History Society is given in Vol. XV. No. 4, page 706.

Since preparing this paper I find that Col. Pollock wrote in the 'Zoologist' an article in which I see that he did me the honour to quote me extensively on the Gaur, his whole article is copied into Vol. XII, No. 1 of the Journal of the Bombay Natural History Society, where some startling measurements of the Burmese Gaur as compared with the Indian are given on page 193."

In the jungle close to where Mr. Martin lived for several years a herd of about 40 Gaur made their head-quarters and so he had ample opportunity of observing their habits, which he writes of as follows:—

"As regards habits, I can only give you my own observations, which are limited to the High Range, and do not extend even to the Cardamom Hills, or ghauts. You will find that their habits become modified in the Mysore Bamboo jungles described by Sanderson, and for the Central Provinces Sterndale gives descriptions. The specimen-hunting American, Hornaday, describes what he observed on the Anamallays.

For several years when I lived in the Old Sothapara Bungalow, a herd of about 40 lived in the jungle opposite, in what is now Gundumallay Estate. They were very seldom disturbed, and their habits were very regular; they used to appear in the evening any time after 3 p.m. and graze up the grass hills out of sight and return between 6 and 7 a.m. in the morning. But much depended on the weather; for, sometimes they would remain out much later, and on some occasions I have known them not to return to the jungle for several days at a time. They fed mostly on the short grass to be found at 7,000 to 8,000 ft. above the sea, and also on the coarse grasses to be found at the edges of the jungle. Inside the jungle they browsed on "Kurunja" (*Stobilanthes*) and bit off the heads of saplings of many sorts, but more, I think, in idleness than for the sake of food. The Mauritius and Guinea grass I had at Sothapara was a great attraction to those individuals who had once tasted it. Sometimes the bulls were with the herd and sometimes not; calves of all ages there always seemed to be, the young ones being red in colour. The older bulls seemed to wander further a field than the herd did, but they always were within a few miles. Major Rodon got a fine 37 inches head which he called 'Solitary,' and of course it was quite by itself when he shot it, but there was only the 'Gundu' of Gundumallay between it and the herd. Mr. Tollemache got a very nice no-dewlapped bull, with a detachment of the herd which had separated from the main body as they sometimes did. Mr. W. D. Martin got a 28 inch up in Benson's Valley, quite by itself, at a time when we did not

know quite where the herd was. I got a couple of smaller bulls belonging to the same herd, when they were quite away from it. Much has been written and said about the 'Solitary Bull' and some people think that, any bull found by itself deserves this title. My own impression is that most of these solitary bulls are really members of a herd within a few miles, and one is quite certain to meet them with the herd at certain seasons of the year. What I understand by the Solitary Bull, is the aged and morose old beast (with horns worn to a stump perhaps), that either will not or cannot or is not permitted to join the herd. I have known only one such and he was lame from a damaged hoof, and was shot by a French Planter called DeFondclair, near Harehatch. There is always one bull who not only thinks himself to be lord of the herd, but the herd recognizes him as such and in certain circumstances he rushes up, to see the cause of any mysterious alarm.

When I first came to the country I accompanied a friend one evening to have a look for tracks, and we blundered into a small herd of bison in some "Cheppukad" at the foot of the Shola opposite the Kundale Bungalow, (there was no such bungalow of course in those days) and we both ducked down and hid as best as we could, on hearing the stampede around us; in a short time we became aware of a crashing sound and a snorting beast approaching us, and my friend L. stood up and shot at close quarters what turned out to be the bull of the herd.

The other time was even more exciting, for my wife and I were out after ibex, and found a herd of bison on the grass ridge, which led up to the ibex grounds on the Kundale Range. The direction of the wind favouring us, we found an excellent observation place in a cleft between two rocks, in which grew a small rhododendron tree; by using both the rocks and the tree, we were able to shin up the cleft one at a time and get our heads more or less on a level with the ground on which the bison were lying, composedly chewing the cud, about 50 yards off. We never knew exactly why, but we noticed that one by one the bison stood up and took up a more or less crescent shape formation facing us. I suppose our heads slowly appearing and disappearing seemed very suspicious circumstance to them, for after a good gaze in our direction the bull advanced with loud snorts, pawing up the ground, and tossing up tussocks of grass with his horns. He actually gave a loud challenge—a prolonged and alarming 'moo'—quite unlike the grunt of the domestic bull of this country. I had no thought of firing at him, for I was armed with a .450 Express, and only had with me soft hollow-fronted bullets quite unsuited to meet the frontal attack this beast made on our position. I should have told you that another rhododendron was growing with its roots on level with the top of the rocks, in the cleft between which we were by this time hiding. We heard the beast 'go for' the lower branches of this tree and smash them

up with his horns, after which, with loud snorts he came round to one side, and as it seemed to me he would soon descend to the same level as ourselves, and have us at his mercy. I stepped out and faced him at 5 paces, and as he was not quick enough in making up his mind to go, I fired both barrels into his dewlap, and to my relief he turned and bolted with the whole herd. We found no blood at all, and I do not know where my bullets could have lodged. I have no doubt these bison imagined they were being watched by a leopard or a tiger, and not by human beings.

Bison ascended to the highest plateaux, 8,000 ft. above the sea and over on these hills, and live on them if undisturbed for prolonged periods. In spite of their shyness and apparent timidity I am quite sure they are capable of being domesticated at any rate to the same extent as the 'Gayal' of Northern India. Some individuals are, no doubt, more docile than others, as is the case with every cow and every bandy bullock. I have known bison to feed and drink at all times of the day and night.

About their calls, they make several sounds; a long drawn out 'Moo' rather like the English short horn, or a low 'Moo' seemingly enquiring as to the proximity of its neighbours, a rough snort when dashing off in alarm and several repeated short snorts when challenging, say, a carnivorous or supposed carnivorous enemy.

I have known wounded bison to charge, and in one case a Muduvar nearly stepped on a bull in the Vuttavadi Valley in long grass, and was gored in the stomach—marvellous to relate he recovered from the horrible wound.

I do not credit tales of quite unprovoked assault on the part of the Bison in spite of the above case, where, no doubt, the poor brute was quite as alarmed as his victim; it was the result of sudden fright, and not malice of which I believe this great and noble animal to be incapable."

NO. IX.—THE DOMESTIC BREEDS OF INDIAN SHEEP.

Prof. Cossar Ewart, F.R.S., of Edinburgh and myself are engaged in an investigation as to the origin of some of the domestic breeds of sheep, a subject which has been greatly neglected by modern Zoologists, who mostly ignore the domestic races. I should be very much obliged if any members of the Society could supply us with (1) good photographs taken from living animals of the pure races of Indian sheep, (2) skulls with horns as large as possible of typical adult rams, (3) a sample of the skin showing the wool or hair when fully grown. As there has, no doubt, been a great deal of inter-breeding some local knowledge is necessary in selecting the specimens. So far as I know at present there are in India the following distinct species:—(1) the Hunia breed of Nepal with its unicorn variety, which I believe has been segregated and breeds a proportion at least of

unicorn rams; (2) the big coarse-haired Ladak race commonly used for carrying burdens; (3) the very coarse-woolled or hairy brown-breed of Southern India, often kept for fighting purposes; (4) various races of fat-tailed sheep originating in the Persian Gulf, probably much degenerated in India; (5) the black and white Aden breed, and (6) the fine-woolled Afghan breed of which I know absolutely nothing, except its skin in the form of a *poshteen*.

I shall be glad to pay any reasonable expenses entailed in this inquiry, if any one who is interested will communicate with me. Our difficulties are increased by the fact that no live sheep can be imported to England now, except through the Zoological Gardens, and that the Oriental races seldom live long in this country.

H. J. ELWES.

COLESBORN, 22nd April 1911.

[We hope members will help Professor Cossar Ewart and Mr. Elwes in this inquiry, and we shall be happy to forward any skins or heads for members to England.—Eds.]

No. X.—WEIGHT AND MEASUREMENTS OF A SEROW.

At the invitation of a friend, I was out shooting the other day on a tea garden some two miles below the station of Kurseong. We first beat a precipitous hillside (elevation about 1,800') covered with light bamboo and scrub jungle. The luck was all on my friend's side, the result of two barrels and a third to "mak sicca" being a Barking deer (*Cervulus muntjac*) and a Serow (*Nemorhædus bubalinus*), the measurements of the latter, taken by myself personally, were as follows:—

Length, tip of muzzle to root of tail	..	5'-4"
Do. do. including tail	..	5'-7"
Height at withers	.. .. .	3'
Girth behind shoulder	.. .. .	3'-3"
Length of horns	.. .. .	7 $\frac{1}{8}$ "
Weight	.. .. .	..260 lbs.

The above was a female and seemed in first class condition. The flesh which we tasted we thought somewhat resembled beef.

Lower down in the Balasar valley we were lucky enough to secure a woodcock, and flushed a second, which however was far too wary a bird to leave the bamboo jungle, though the beaters did their best to make him show himself. A Kalij and some other birds ended a most enjoyable little shoot.

ALEX. M. PRIMROSE.

LONGVIEW, T. E., PUNKABARI P. O.,
16th March 1911.

No. XI.—WEIGHT AND MEASUREMENTS OF A GORAL.

My collector yesterday, when out after birds at an elevation of about 3,500' came across a Goral (*Cemas goral*) (which I take to be a young male) which he secured. The measurements read as follows:—

Total length (between legs) muzzle to root of the tail ..	41 $\frac{1}{2}$ "
Tail without hair	6"
Tail, including hair	10 $\frac{1}{2}$ "
Height at withers	26 $\frac{1}{2}$ "
Girth at shoulder	28"
Ear from base at tip	6"
Horn, right	6 $\frac{1}{16}$ "
Do. left	6"
Weight	56 lbs.

A. M. PRIMROSE.

LONGVIEW, T. E.,

PUNKABARI P. O., 4th August 1911.

No. XII.—STRANGE MORTALITY AMONGST BLACK BUCK
(*ANTILOPE CERVICAPRA*).

In Vol. XVIII, Part 2, pages 493-4, some notes appeared under the heading "Do wild animals die a natural death." In these notes attention was drawn to the fact that, in spite of the numerous herds of buck abounding in certain localities, sportsmen rarely, if ever, found a buck dead, which appeared to have succumbed to natural causes, nor do they, I believe, meet with natives who admit having found animals dead without being able to assign a cause. The following facts may not be without interest. In December last Colonel Farmer and I were out on some work on the Farm at Hissar in the Punjab. On our way home one of our Camel Sowars noticed a buck lying stretched out in an open place. On going to the spot we found a very fine buck lying quite in the open and evidently not long dead. We examined the carcase carefully and so did the men but we failed to find any wound or injury. There was a greenish watery discharge from the mouth and nostrils. The animal was in splendid condition. We hoisted the buck on a camel, brought it in and made a *post-mortem*. The lesions, we observed, were those of gastro-enteritis, as if the result of some irritant poison. The Bir Chuprassis were warned to keep a sharp look-out in case there was disease prevalent; some two days after a doe and fawn were found dead and brought in, we made *post-mortems* on these animals and the appearances presented were exactly the same as those seen in the buck. We did not hear of any other deaths, and there were no cases of sickness or death among the stock grazing over the country. It is strange that these animals should have presented similar

post-mortem lesions ; other animals may have succumbed, but we did not hear of any. There is no question that once vultures become aware of the presence of carrion, it does not take long for them to dispose of it. We saw them dispose of the carcase of a fine donkey, in, so to speak, the twinkling of an eye. The number of vultures which fed on the carcase of this donkey would have consumed a buck in about seven minutes.

G. H. EVANS,
Lieut.-Colonel.

LAHORE, 21st April 1911.

No. XIII.—LARGE HEADS OF MALAY SAMBAR AND BROW
ANTLERED DEER.

I measured the horns of a Malay Sambar (*Cervus unicolor equinus*), the property of Mr. Stile of the Burma Oil Co. at Magwe, and they far exceed the record measurements I sent you some time ago (B. N. H. S. Jour., Vol. XIX, p. 254). They are: left horn 38", right horn 37½"; girth 10"; tip to tip 19", brow tine 22".

I recently shot some thamin (*Cervus eldi*) in the Prome district and the largest head measures: left horn 40"; brow antler 17", circumference 6". Right horn 41½", brow antler 17", girth 6', Points 6 × 7. Tip to tip 19", spread 35½". Height at shoulder 44".

Will you please tell me what constitutes the record for thamin?

H. J. DAVIS, F. G. S.
Geologist,
BURMA OIL COMPANY, LIMITED.

YEANGYAUNG.

[The Sambar head is three inches longer than the previous record and with much longer brow tines.

According to the *Records of Big Game*, 1907 Edition, the record Thamin head is—length 42', circumference 5", tip to tip 29", width inside 24", points 3 × 2.—EDS.]

No. XIV.—CROW AND ITS FOOD.

In order to study the habits of some carrion-feeding birds, I happened, in December 1910, to pay a visit to Dhappa, a suburb of Calcutta, where all the refuse of the town is thrown. While there, my attention was attracted by the movements of a Crow (*C. splendens*), and on close examination, I noticed that it was feeding on aquatic insects, which it captured in a very peculiar manner from a large pool of dirty water. It hovered over the surface, at a height of about 15 feet, with its head down, and when an insect attracted it, it would plunge into the water, only to rise and repeat the performance again. The insects were caught with the beak, and during the downward swoops half the bird's body used occasionally

to be submerged in the water. I had a long distance to go that day and was unable to devote much time to this interesting bird, which seemed to have adopted a new method of obtaining its food. And what is more, it was no "prentice hand" at the game. Its whole proceeding was so like that of a kingfisher, that I could not help thinking that this was a typical example illustrating how a change in the conditions of life may lead to the development of a new instinct, which, if continued for a sufficiently long period, might, as remarked by Romanes, alter the ancestral instinct to meet the requirements of a novel environment.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

CALCUTTA, 27th February 1911.

No. XV.—NOTES RELATING TO THE HABITS AND NIDIFICATION
OF THE BLACK-HEADED SIBIA, *LIOPTILA*
CAPISTRATA, (VIGORS).

The Black-headed Sibia is a common bird throughout the North-West Himalayas, and is very abundant in the neighbourhood of Simla. It frequents the outer ranges of these mountains between 5,000 and 8,000 feet, but is most plentiful at about 6,000-7,000 feet. It is a permanent resident throughout its habitat.

Hill-sides and ravines covered with dense, moist forests, especially oaks and other large trees, thickly coated with moss, are its favourite resorts. It is strictly arboreal, keeping generally to high trees, though occasionally it is to be seen on small ones, and also on bushes. It is very active; constantly moving in and out of the smaller branches, or hopping along the larger ones. When searching for food, it frequently clings to a twig, and turns upside down like a Tit. When alarmed or startled, the crest is erected, and a harsh danger note emitted.

During the summer months it is usually to be seen either singly or in pairs, but at other seasons in small parties of three or four. It is a very noisy bird, and one of its loud shrill, ringing notes, which may be likened to the syllables "tīrī-rērē-rērē-rēē" is to be heard throughout the year. Hutton has syllabized another of its notes as "tittêrê-tittêrê-twèyò," the last, as observed by Scully, "being uttered after a short pause, and in a more subdued tone." Major Magrath remarks:—"The note of this Sibia is a single pretty whistle pitched in a high key, and repeated four or five times rapidly. At a distance it sounds like the tinkling of a little silver bell. When hunting for food, the note is a soft rattling chuckle. In addition to its characteristic note of a very high pitched and quickly repeated "ting," "ting," "ting," it has an alarm note like the Thrushes (*Merula*), only more rapidly repeated, and not so loud."

It is a shy creature, though at times I have noticed it feeding on trees, growing by the side of public roads, and apparently quite indifferent to the passers below.

Insects appear to constitute its chief diet, but the gizzards of several that I have examined, from time to time, contained berries, seeds, and other vegetable matter. The *Rhododendron* trees, when in flower, have a great attraction for these birds, and sometimes as many as half a dozen or more may be counted on a single tree, eagerly searching for insects, which are likewise attracted by the flowers. In order to secure these insects, the birds plunge the whole of their heads into the flowers, and getting the pollen smeared on to their heads and cheeks, present, at close quarters, a most comical appearance. Any little stray Tit or *Ixulus*, which happens to visit a tree on which these *Sibias* are feeding, is immediately driven away in a most pugnacious manner.

References to the habits of this bird are meagre, but I have been able to collect the following:—

Hutton states:—"At Mussoorie this bird remains at an elevation of 7,000 feet throughout the year, but I never saw it under 6,500 feet."

Jerdon writes: "It is one of the most abundant birds about Darjeeling. It frequents the highest trees, climbing up the larger branches, and clinging round and below the smaller branches, almost like a Woodpecker or Nuthatch. It is often seen alone or in pairs, but occasionally in small parties, and is constantly uttering its twittering call, often answered by one at some little distance. It is very fond of concealing itself in the thick masses of Epiphytic plants found on all lofty trees in Sikkim, and its favourite food is the fruit of the *Epiphytic andromeda*, so abundant about Darjeeling; it occasionally, however, picks insects from moss or crevices of the bark. I on one occasion saw it at Kurseong, 4,500 feet high, in winter, climbing up and down the thatched roof of a bungalow."

Stoliczka in his Ornithological Observations in the Sutlej Valley says:—"Rare about Kotegurh between 5,000 and 7,000 feet; chiefly frequents brushwood and low forests; generally feeding on insects."

Scully in his contribution to the Ornithology of Nepal remarks:—"Common on the hills round the Nepal Valley, at elevations of from 6,000 to 8,000 feet, but never seen in the central woods; in winter it is also common in the upper part of the Chitlang Valley. It principally affects large tree forest, but is often found in dense bushes on steeply sloping hill-sides; it is fond of the moss-covered branches of the large trees, to which it occasionally clings head downwards. In winter it is social, very bold and noisy, its cry then resembling the scolding alarm note of *Pycnonotus pygæus*, but louder and more harsh. In the breeding season, May and June, only single birds or pairs are seen."

Gammie observes :—"As might be expected from the bird's habit of feeding on the insects on moss-covered trees in moist forests, the nests were in forest by the side of streams."

Oates notes :—"Frequents high trees, feeding on fruit and insects. Found throughout Himalayas from the Hazara country to Bhutan at elevations of from 5,000 to 8,000 feet."

Major Walton in his Notes on birds collected in Kumaon, says : "Very common, especially on the edge of forest. It has a very loud, shrill song, which it sings perched upon some conspicuous branch. Besides this, it has a variety of very harsh notes."

I think the measurements given by Oates in the "Fauna" for this species are a little small. Selecting three Simla specimens at random in my collection, I find that the *length* varies from 9.4" to 9.9"; the *expanse* from 11.5" to 12.6"; the *wing* from 3.9" to 4.25"; the *tail* from 4.25" to 4.75"; the *bill from gape* from 1" to 1.05"; and the *tarsus* from 1.1" to 1.45". Of course the case may be different with a large series of birds from various parts of these mountains, but judging from the measurements given by Scully (S.F. Vol. VIII, p. 292) of 18 Nepal birds, it would seem that specimens from the Eastern Himalayas are, on the whole, slightly *smaller* than those found westwards. Hume, however, commenting (Rough Draft, p. 267), on the separation by Gray of the Western bird from the Nepal form as a distinct species, under Hodgson's name *Sibia nigriceps*, observed that the *only* difference which he could detect was that eastern specimens were a shade brighter coloured.

The female in this species is the smaller bird.

The mouth is pale fleshy.

In the description of this species, Oates makes no mention of the facts that the feathers of the head are white shafted for their basal halves, and that the chin feathers are whitish, or very pale fulvous (more so in females) passing into the rufous of the breast. Again in the females, the head feathers are sometimes dark sooty-brown. The collar round the *upper* portion of the neck is not *bright* but *pale* rufous. The lesser wing-coverts in my specimens are not *rufous*, but *dark brownish-grey* mixed with black; the primaries are distinctly insinuated towards the tips; and the tertiaries, besides being pale shafted for their entire lengths, are usually edged with black on the inner margins.

On three or four occasions, I have had the good fortune to witness the courtship of these birds, which is rather amusing. One runs, or rather hops, along a branch, with drooping wings and cocked tail, till it reaches its mate, and then both birds sit, side by side, with ruffled feathers for a few seconds, after which this process is repeated over and over again; the birds eventually flying off to another tree, and commencing afresh as before. A peculiar sharp twitter or chuckle is emitted by one of the birds during these antics, but the

latter all end here, and must presumably be only the "preliminaries," for I have never yet seen a pair *in copula*. I must not forget to mention here two other points. The first is that I have usually noticed more than *two* birds taking part in these courtships, and the second is that the hens in this species sometimes appear to court the cocks. On the 25th June 1911 I came across three birds—a *large* one, and two *small* ones—indulging in the antics already described. The large bird was a cock, and the two small ones were, I think, hens; and I must confess that their behaviour gave me the impression that they were fighting with each other for the possession of the male. One of the small birds drove the other small one away, and then she squatted on a branch by the side of the large bird. Just as they got together, I shot the couple, and on dissection, they turned out, as I suspected, to be of the opposite sexes. Now the bird that had been driven away was, as already stated, a *small* bird, and I think there can be little doubt that it was another female. In spite of repeated attempts, however, I failed to secure it, for had I succeeded, all uncertainty in the matter would have been removed, still I have no doubt whatever in my own mind that it was a *female*. All this behaviour on the part of the hens sounds very unladylike, I know, and is at variance with Darwin's theory of Sexual Selection, to wit, that among all species of animals there is a competition among the males to secure females as mates, but I take this opportunity of putting on record what I think to be true.

Hume states that this bird "lays during May and June, and perhaps part of July:" the earliest and latest dates mentioned in his work "Nests and Eggs," (2nd edition), on which eggs were found are:—

<i>Earliest date</i>	..	..	21st May	..	..	Sikkim: 2 fresh eggs.
<i>Latest date</i>	..	..	10th July	..	..	Naini Tal: this nest was really found on 11th July "containing two chicks not a day old."

My *earliest* and *latest* dates are 9th June, (3 semi-incubated eggs), and 7th August (3 fresh eggs), respectively. I may, however, mention that on the 9th May I found a nest containing two young ones, about a week or ten days old. The eggs in this case must have been laid some time during the *third week of April*, but this is exceptional. In these parts May and June are undoubtedly the months during which the majority of these birds lay; most eggs are, however, to be taken in June. In regard to the breeding time of this species, Captain G. F. L. Marshall notes:—"Nest building commences May: Eggs taken at Murree on 5th June, in Kumaon on 29th June and 3rd July: season ends."

These *Sibias* never breed] in company, and they only rear one brood annually.

The nests are generally built either on trees or bushes on the edges of forests, though it is by no means unusual to find them towards the middle, or in the heart of a thickly covered hill-side.

The nests are placed either at the ends of branches, or on one of the upper forks, or where several small twigs shoot upwards from a horizontal branch, and no matter what their position, they are, as a rule, well concealed. In fact, they are very difficult nests to find, but the birds themselves sometimes give away the show by uttering a sharp twitter, if a person happens to approach too close to the tree containing the nest. And here I take the opportunity of giving other oologists a "tip." When the hen is sitting on eggs, the cock generally hangs about in the vicinity, and when his loud notes are heard *constantly* issuing from a *particular* tree, it is always best to examine carefully, not only that tree, but all the other likely ones close by: by observing this, I have been rewarded on two or three occasions by finding the nests—on the last, I remember getting a beautiful clutch of three fresh eggs.

So far as my experience goes, the trees which are preferred in Simla for nesting by these birds are either Oaks or Rhododendrons. Only once I have found a nest placed on a small Holly.

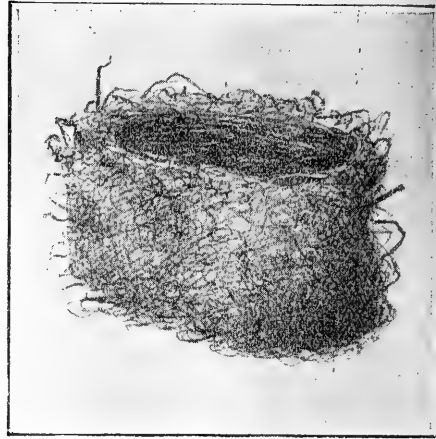
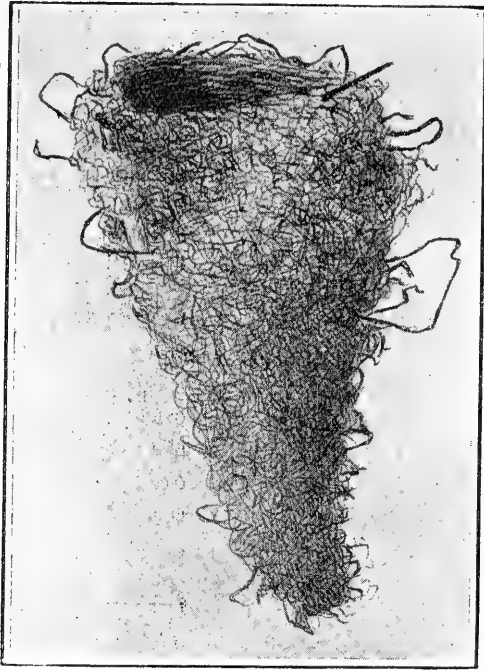
The heights of the nests varied from 8 to 60 feet, but the average of 17 nests was $26\frac{1}{2}$ feet.

The nests are neat cup-shaped structures, composed exteriorly of a layer of moss, in which a good many leaves, strips of bark, and cobwebs are occasionally incorporated, and lined interiorly with the roots of the maiden-hair fern and other plants. One nest, which I have in my collection, is of a very unusual shape: it is something like an inverted cone, and is $7\frac{1}{2}$ inches in height. It was placed against the trunk of a medium sized Rhododendron, and was beautifully concealed by some twigs shooting at right angles from below it. The drawing below shows the difference in shape between this nest and that of a normal one.

The materials composing the nests are firmly interwoven together, and the structures themselves are securely attached to the surrounding twigs. Some of the nests situated at the extreme ends of branches appeared to occupy most precarious positions, but I have never yet known one to be blown down by the wind.

The dimensions of six nests (excluding the abnormal one) were as follows:—

Diameter of egg-cavity	3"
Depth of ditto	varies from 1·75" to 2·2"
External diameter	4·25" to 4·5"
Height	3" to 3·5"
Thickness of bottom	1" to 1·6"
Thickness of sides	·65" to ·75"



Both birds share in carrying materials, and in building operations. I have, however, on one or two occasions noticed that the cock brought the materials, and the hen alone was the architect. Once a site has been chosen, building operations progress with great rapidity, but I have not yet been able to ascertain the exact length of time taken by the birds in constructing a nest. When the latter has been completed, a very short period seems to elapse before the first egg is laid.

These *Sibias* have a peculiar habit of deserting their nests on the least provocation—*merely climbing* the tree and only peeping into the nest in some cases, is enough—and it is, therefore, most difficult to make any observations. I have been unable to ascertain the time which elapses between the laying of the eggs, but the hen begins to brood after the first egg has been laid. She is very wary, and genearily leaves the nest long before a person gets to the tree. So far as my experiences go, I do not think that the cock takes any part in the hatching of the eggs.

The number of eggs varied from 2 to 3. In one nest I found a solitary chick wriggling out of its shell, and the largest number of young found in a nest were two.

Owing to the difficulties of examining the nests referred to above, I am unable to give the period of incubation, but I doubt whether it exceeds 14 days.

Both birds feed the young, but there are gaps in my notes as to how long the latter remain in the nest. I have never noticed them following the old birds about, but have no doubt that they must do so for some time like other young birds.

The only reference to this bird's nest which I have been able to find, since the publication of the 2nd edition of Hume's "Nests and Eggs" is that by Lt.-Col. R. H. Rattray in his "Birds' Nesting in the Murree Hills and Gullies" (Journal, Bombay Natural History Society, Vol. XVI, p. 423). He says: "The Black-headed Sibia is fairly common. Nests very hard to find; they are generally high up in a dense fir tree. The nest is a very neat structure, and generally placed low down in a bough. Eggs pale blue, in some almost white, spotted and boldly blotched with red marks like dried blood, and a few subsidiary markings greyish purple. The birds often give away the nesting site by keeping up a shrill cry. They desert the nest if the tree is climbed, even when the nest is not touched by hand. I have taken nests both at Murree and Dungagali."

On looking through my notes relating to the various nests taken of this species, I reproduce one, under date 8th July, which is rather curious; "Found a nest on 20th June, containing two fresh eggs, placed at the junction of several upright twigs shooting from the horizontal branch of a small Rhododendron; exact height from ground 25 feet: elevation 6,000 feet: hen shot off nest. Both nest and eggs removed. On passing this spot a few days afterwards, *viz.*, on 8th July, I happened to look up at this tree, and was surprised to see that another nest had been constructed in *identically the same place*, and that it contained 3 fresh eggs! The hen was sitting at the time."

The eggs of this bird are, perhaps, the prettiest ones I have ever seen up to this. For a detailed description of them, I would refer the reader to Hume's admirable account in his "Nests and Eggs of Indian Birds," 2nd Edition, Vol. I, p. 134.

In length my eggs varied from .95" to 1.12"; and in breadth from .67" to .75"; but the average of 14 specimens measured was 1" x .71".

The weights of 8 *fresh* eggs were: 72, 75, 60, 63½, 66, 62, 65 and 68 grains. Average weight = 66.4 grains.

The weights of 3 semi-incubated eggs were: 59, 56, and 54 grains. Average weight = 56.3 grains.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

"CARLTON GROVE,"

SIMLA, S. W., 19th July 1911.

No. XVI.—A NEW BAR-WING FROM BURMA.

In the Bulletin of the Brit. Ornith. Club Vol. XXVII, p. 9., Major H. H. Harington described a new Bar-wing from Burma as follows:—

Actinodura radcliffei. sp. n.

Adult male.—Differs from *A. ramsayi* (Walden) in having the forepart of the head and crest darker ferruginous, the general colour of the upper parts ochraceous, instead of cinereous olive-brown, and the throat, breast and sides of the body rich ochraceous; the abdomen conspicuously white, and the feathers of the throat have rather conspicuous blackish shaft-streaks. Iris brown; bill dark brown; legs pale brown.

Total length about 9·7 inches; culmen 0·8; wing 3·6; tail 5·0; tarsus 1·2.

Habitat.—Ruby Mines District, Upper Burma.

Type.—♂ Ruby Mines District, 24-3-1910.—Obtained by Major H. Delmé Radcliffe. Presented to the British Museum (Natural History).

No. XVII.—CURIOUS BEHAVIOUR OF A MYNA.

While in camp in a mango bough last cold weather, I noticed my tame Myna going through most curious antics. He first bent his tail down almost perpendicular to the ground, and then putting his head between his legs rubbed his beak up and down the tail feathers, so vigorously that he fell nearly head overheels several times. On looking more closely, I saw that he was picking up one by one the large red ants which live on mango, and killing them by rubbing them against the stiff tail feathers in the way I have described. He killed or maimed a dozen or more in this way while I was watching him. He did not attempt to eat them.

F. B. SCOTT, LIEUT.

MUSSOORIE, 19th June 1911.

No. XVIII.—NOTES ON BIRDS ROUND RAWAL PINDI.

Cross between *Molpastes leucogenys* and *M. intermedius*.

On June 22nd I found a bulbul's nest in a bush, and seeing that the sitting bird had red undertail coverts, I put it down as *M. intermedius*. But when she left the nest she was at once joined by a *M. leucogenys*. Next day I assured myself that this was the pair and secured both birds, to find that the hen was not *M. intermedius*. On comparison with other specimens, it is clear that the hen herself must be a hybrid—roughly described it is of the size and appearance of *leucogenys*, but the ear coverts are light brown, and the undertail coverts red tinged with yellow. The eggs, 3 in number, were partly incubated and small, measuring 2·10×1·70, 2·25×1·75 and 2·10×1·65, cmm. respectively. The nest was made of coarse dry grass, etc., and lined with finer grass, being rather more substantial than most nests of *leucogenys*.

Niltava sundara, Hodgs., at Murree.

In the Fauna, Vol. II, p. 41. The Himalayan distribution of this bird is given as "from Simla to Assam," hence it may be of interest to note that in May and June of this year I found this one of the common birds in the jungles at Murree. It frequents bushes and the lower branches of trees, and when one approaches near to its nest, it has the habit of sitting in one spot and uttering at intervals a dull squeaking note, so that it is hard to spot. It occasionally spreads or raises its tail. The nests are hard to find, their sites being similar to those adopted by English Robins when building on or near the ground: they are of moss, lined with fine roots or stems, and the eggs are similar to the lightly marked variety of Robin's eggs.

I also took on May 30th a fresh clutch of four eggs of *Petrophila erythrogastra* (Vig.) the chestnut-bellied Rock Thrush whose western limit is given in the "Fauna" as Chamba. The nest was composed entirely of pine needles and was placed in a small tunnel in a bank. They were pinkish buff in colour, closely speckled with a darker shade of the same.

H. WHISTLER,

Indian Police.

RAWAL PINDI, 30th June 1911.

[In Captain Whitehead's paper on the birds of Kohat, which was reprinted from the Ibis in the Journal, Vol. XX, p. 182, there are some remarks on a series of hybrid bulbuls, which are said to be crosses between *M. intermedius* and *M. leucogenys*. Mr. Whistler's bird, which he has kindly forwarded for examination seems to agree fairly closely with No. 689 ♀ of Captain Whitehead's series.

From *M. intermedius* this hybrid differs in being rather lighter, the abdomen dirty white and the flanks grey. The ear coverts are a pale washed out brown and the under-tail coverts are yellowish orange shading into washed crimson at the tips.

N. B. KINNEAR.]

NO. XIX —NOTES ON THE NIDIFICATION OF *MICROCICHLA* *SCOULERI*, (Vigors), THE LITTLE FORKTAIL.

The eggs of the Little Forktail have, so far as I am aware, not hitherto been taken, and the following particulars in regard to its nidification will, doubtless, be of considerable interest to naturalists.

On the 13th May 1910, while out searching for nests by the side of a stream in the neighbourhood of Simla, at an elevation of about 6,500 feet, I came across a pair of these birds, which appeared to be courting, and while watching them, I saw them twice *in copula*. Making sure that the

nest was somewhere in the vicinity, I stationed men to watch the spot for several days, but in spite of a most diligent and exhaustive search, the nest could not be located, and the birds subsequently deserted this portion of the stream.

The following year one of my hunters reported on the 24th April that he had found a nest of this species by the side of a stream, about three miles from Simla in a southerly direction, near the Behar village in Keonthal territory, and that it probably contained eggs, as the old bird was sitting hard. On the 26th instant, accompanied by my friend, Mr. W. A. Hughes, I visited the spot—an ideal haunt for this intrepid little bird. The water from the stream rushed down a wall of rock fully 125 feet or more in height, and fell below with a deafening noise in a dense mass of foam and spray. Here about 50 feet above us, in a small niche in the face of the wall by the side of the water, and over which a small slab of stone projected, was placed the Forktail's nest. Some moss was growing below it, and as the sides of the latter were composed of the same material, it blended admirably with its surroundings. So well was concealment effected, that it would have been utterly impossible to have discovered the nest, unless betrayed by the birds themselves; and, indeed, its exact position had only been determined by watching their movements.

On our arrival, only one bird was noticed searching actively for food along the slippery wall of rock, and just as we got to the bottom of the Fall, the other one, apparently alarmed by our presence, hurriedly left the nest. I had decided that the shooting of the bird (for although by now the identification was complete, yet I wished to leave no grounds for doubt), should devolve on Mr. Hughes, and right well did he do his share of the business. After leaving the nest, the old bird (it turned out subsequently to be the hen) flew down stream for a few yards, and settled on a prominent stone, thus affording an excellent shot, and which my friend readily availed himself of. Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U., very kindly identified the skin for me, and unhesitatingly pronounced it to belong to our bird.

The nest was reached by means of a rope thrown from above, and contained one egg on the point of hatching off, and one young, about a couple of days old.

The egg measured $\cdot 8'' \times \cdot 6''$; and its weight was 31 grains.

Now, curious as it may appear, among the eggs of the Western Spotted Forktail (*Henicurus maculatus*) two distinct types of colouration are generally to be found in the same nest, viz., those having a greenish-white ground colour, marked with yellowish-brown (and the majority are of this type), and those having a dingy pink ground colour, marked with reddish-brown. The egg of our bird bore a faint resemblance to the latter type.

The elevation of the spot was about 5,500 feet.

Keonthal State, 29th April 1911.—Two more nests to-day: both situated in niches of rocks by the sides of large waterfalls, and well concealed. They were only discovered by watching the movements of the parent birds. Elevation about 5,000 feet.

(a) Could not unfortunately be approached on account of its dangerous position. It probably contained either hard set eggs, or young ones just hatched, as the old bird sat very tight, and only left the nest after several large stones had been rolled down from above the Fall.

(b) Contained 3 eggs on the point of hatching off. Compared with the positions of the other nests, this one was easy of access, and was not more than about 12 feet high. The nest, as already stated, was placed in the niche of a rock, and was completely hidden by a large quantity of water which fell continuously over it. So well was it concealed that, although I was not more than half a dozen paces from it, I could not see it. To get to their home, or out of it, the birds had invariably to pass through this dense sheet of water!

The identification of the bird was a most trying experience. On my arrival at the spot, I had noticed a bird dart out of the water, but it was impossible to say with certainty what it was. Fortunately there was a large boulder just in front of the nest in the middle of the stream, and I took advantage of this by hiding behind it. The water was up to my ankles, and my cramped position soon began to tell on me. After a few minutes of waiting, the old bird appeared on the scene, and one would have thought that with hard set eggs, she would have got into her nest at once. But it was not so with the Little Forktail: she had no intention whatever of being rushed in this fashion, and thus giving away the show. For more than an hour I was kept in suspense, and was beginning to think that she was not the owner of the nest. At one time she would flit from rock to rock, at another, dart into the water after a passing insect. Now she would gingerly plume her feathers, now sit with them ruffled, and assume a sort of unconcerned expression—the eggs, although exposed for so long a time, apparently gave her no cause for anxiety. My patience was nearly exhausted, and I had almost given up all hopes, when her Ladyship apparently recollecting that her eggs were getting cold, after a few hops along the rocks, suddenly darted through the sheet of water, and settled down into her nest.

The nests in both cases were deep cups, composed exteriorly of moss, and lined with fine moss-roots, and dead and skeleton leaves: in other words they were simply small editions of the nest of the Western Spotted Forktail (*Henicurus maculatus*). I have at present before me four nests of the latter, and comparing these with those of our bird, I can find absolutely no difference whatever, except for size.

I find a note recorded in my Journals with reference to the nests of the Western Spotted Forktail that they have, as a rule, a good deal of damp earth mixed in their bases, and that this apparently helps towards concealment by keeping the moss fresh and green. The same was the case with the Little Forktail. When *in situ* the moss composing the external layers of the nests was quite fresh and damp; by the time they reached home, the moss had dried up, and began to drop off, and the structures assumed a shrivelled up appearance.

For purposes of comparison, I give below detailed measurements of the nests of the two species of Forktails:—

Details.	<i>Henicurus maculatus</i> . (Four nests).	<i>Microcichla scouleri</i> . (Two nests).
Diameter of egg-cavity ..	3"	From 2.25" to 2.4"
Depth of ditto ..	From 2" to 3"	„ 1.6" to 1.75"
External diameter	„ 5" to 5.75"	„ 3.6" to 4.5"
Height	„ 3.25" to 4.5"	„ 2.25" to 3.5"
Thickness of bottom ..	„ .9" to 1.5"	„ .6" to .9"
Thickness of sides (average)	„ 1" to 1.5"	„ .65" to 1"

The eggs of this find measured .85" × .6"; .83" × .58"; and .83" × .6"; and their weights were 1 @ 31 grains, and 2 @ 33 grains each.

Summing up the results of the two nests, I find that the eggs varied in length from .8" to .85"; and in breadth from .58" to .6"; but the average measurements of the 4 eggs were .82" × .59"; and their average weight was 32 grains.

In shape the eggs were elongated ovals, somewhat pointed towards the small end; the texture of the shells was fine, and they had very little gloss, if any. Their ground colour was almost white, or perhaps *very* pale dingy pink, and they were thinly spotted and speckled, chiefly towards the large end, with reddish-brown. In one egg the spots and specks have a tendency to form an irregular zone.

The number of eggs laid by this species apparently varies from 2 to 3.

Since writing these notes Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U., informs me that he recorded the finding of this bird's nest some years ago both in the "*Ibis*", and in the Bombay Natural History Society's Journal, and that he is under the impression that B. B. Osmaston also recorded finding the nest in the latter paper. Mr. Baker adds "the

eggs have been taken by Col. Ward in Kashmir; I think by S. L. Whympers in Garwhal; and possibly by Davidson and Col. Wilson in Kashmir, but I am not sure of these two last."

P. T. L. DODSWORTH, F.Z.S. M.B.O.U.

"CARLTON GROVE" SIMLA, S. W.,

19th May 1911.

No. XX.—NESTING NOTES FROM LOWER BURMA.

On 13th April 1911 I found the nest of the Tweedale Scimitar Bbler (*Pomatorhinus nuchalis*). It was placed on a ledge of rock by the side of the circular road at Thandaung where there is a high cutting. The hill above is covered with heavy bamboo jungle and the dead leaves falling have collected on the ledges of the rock. The nest was cup-shaped almost covered with the dead leaves and was $3\frac{3}{4}$ " deep by $3\frac{5}{8}$ " in. diameter (inside). It consisted of dead bamboo leaves loosely rolled round the cup and wrapped round with narrow leaves of a coarse grass between the layers of the bamboo leaves to keep them together. Inside dry grass bents and finished with fine grass. The eggs were 3, measuring $1\cdot01'' \times \cdot75''$, a pure white with a slight glass blunt at larger end. See Vol. XV, p. 519.

On the 19th April I came across the nest of the Bar-tailed Cuckoo Dove *Macropygia tusalia* (1312). The nest of sticks was placed on bracken leaves not far from the ground in dense bamboo and undergrowth. Higher up the hill, after the undergrowth had ceased, in bamboo jungle consisting of separate clumps of six, eight or ten bamboos and quite open, I saw a pad of moss where the bamboo shoots take off in a cluster. On going up a long-tailed dove flew off. I waited 25 minutes and shot it practically on the nest. This consisted of a flat pad of moss almost quite hard about twelve feet up the bamboo. It was difficult to get the egg as I expected it would roll off every minute as we telescoped the bamboo.

The egg measured $1\cdot26'' \times \cdot84''$, a perfect ellipse and cream tinged with very faint coffee colour. The bird was the Little Malay Cuckoo Dove, *Macropygia ruficeps* (1314).

S. M. ROBINSON.

10, HALPIN ROAD, RANGOON,

13th July 1911.

No. XXI.—SOME WINTER VISITORS TO RAWAL PINDI.

It may be of some interest to record the following birds as having come to my notice in Rawal Pindi during the past winter. The Wall Creeper (*Tichodroma muraria*) has been common in the dry stony nullahs that intersect the country to the south of the Cantonments. I first noticed it on

the 25th October and from that date onwards have seen several. On 21st March I secured a male just completing the moult in to breeding plumage at Gujar Khan, some 25 miles south-east of Pindi. In flight they remind one somewhat of the Hoopoe, so far as shape and manner go. Whilst climbing they flirt their wings and call often, especially after being disturbed.

The Reed Bunting (*Emberiza schachielus*) has been numerous at Kunna jheel and I have also met with it in the nullahs near the R. Sohan, on bare stony ground interspersed with a few bushes.

Himalayan Goldfinches (*Carduelis caniceps*) were common for a short time in February; they were generally to be met with in Shishain trees bordering country roads.

In January and February there were large number of the Blue headed Redstart (*Adelura coruleicephala*) in cantonments, and about the same time I saw a few white-capped Redstarts (*Chimarrhornis leucocephalus*) and Plumbeous Redstart (*Rhyacornis fuliginosus*) in the rocky nullah of the river Ley, a short way above its junction with the river Sohan.

I also obtained the following birds:—The Brambling (*Fringilla montifringilla*) female, 7th January. The green-backed Tit (*Parus monticola*), 28th January, male: a pair seen. The large Cuckoo-Shrike (*Graucalus macii*), female, 21st February. The Missel Thrush (*Turdus viscivorus*) male, 29th January; male, 19th February. The black throated Accentor (*Tharrhaleus atrigularis*) one specimen, 7th February.

H. WHISTLER, INDIAN POLICE.

RAWAL PINDI.

XXII.—SEASONAL MOVEMENTS OF THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*).

I had hoped to have been able to reply decisively to Mr. Dodsworth's query about Himalayan greenfinches, but owing to pressure of work I have not been able to do very much this year. I can say, however, that two years ago there were young greenfinches below Dagshai in May, and I then came to the conclusion that they had bred at the lower level in April, and could proceed to higher altitudes to breed in July, as they do in the Murree Hills. Mr. Dodsworth proved that those birds bred beyond Simla in July, and I think I am correct in stating they breed at a lower level in April.

These birds are common all round Dagshai in flocks from November to March.

R. B. SKINNER, CAPT., R.E.

DAGSHAI, SIMLA HILLS.

29th May 1911.

No. XXIII.—OCCURRENCE OF *HEMILOPHUS PULVERULENTUS*,
(TEMM), THE GREAT SLATY WOODPECKER IN THE
NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

In the "Fauna," Birds, VII, III, page 70, the range of this species *westwards* along the Terai and base of the Himalayas is given as "*Kumaon or, perhaps, Dehra Dun.*" It may, therefore, be worth recording that late in August 1907, I came across a party of these Woodpeckers, not more than a mile and a half from Simla, on what is locally known as the "Long road to Annandale," at an elevation of about 6,800 feet. There were four birds, two large ones and two small ones, and judging from the behaviour of the latter, there seemed little doubt that they had recently left their nest, and were following their parents about.

It is possible that these Woodpeckers had bred in the neighbourhood? I stood and watched them feeding on some pines and low oaks for more than half an hour. They were not shy, and allowed me to approach fairly close to them. Unfortunately, I did not have a gun with me at the time, so was unable to procure a specimen. I have never seen this species here either before or since the time mentioned above.

The birds appeared to be moving in a S. W. direction.

P. T. L. DODSWORTH,

F.Z.S., M.B.O.U

"CARLTON GROVE,"

SIMLA, S. W., 14th June 1911.

XXIV.—HORNBILLS DEVOURING YOUNG PAROQUETS.

Some years ago I wrote a note for the Journal commenting on the apparent immunity from foes of certain Indian animals and speculating as to what causes prevented their unlimited increase. No one came forward to throw any light on the subject and the point to me still appears a mystery.

One of the animals I mentioned was the common paroquet, however I have now discovered at least one enemy of the latter, and as the fact is not mentioned in Jerdon it may possibly be worth inserting in your notes.

For the last few days my attention had been attracted by some grey hornbills (*Lophoceros birostris*) visiting a hole in a large siras tree, in my garden, and inserting their heads as if to feed young ones. I did not think this could be the case, however, as I had previously seen paroquets coming out of the same hole. I accordingly sent up a boy who reported that there were young paroquets, but that he could not get his hand in.

The next day on my return after a morning's work my man reported that the hornbill had again been at the hole and had succeeded in extracting a

young paroquet which it had seized by the head and killed. He had then driven it off by throwing a stone at it whilst it was proceeding to pull its prey in pieces.

He showed me the young bird, which bore marks corroborating his story.

Perhaps this trait may be known to other readers, but it is quite new to me.

A. NEWNHAM, LT.-COL., I. A.

JULLUNDER, 17th April 1911.

XXV.—JACK SNIPE IN THE CAWNPORE DISTRICT.

With reference to the description of the Jack-Snipe *Gallinago gallinula* and its habits in the May Number of the Journal, would it be of any interest to you to have my figures for the past season of the relative number of the Jack and Fantail snipes shot by me in this district?

They are as follows: out of a total of 204 couple 65 couple were Jack. I think this probably represents a greater proportion than the numbers of Jack seen would bear to those of the Fantail, as on several occasions large wisps of the latter went away without being shot at. Still these figures show that this season at least Jacks were very plentiful in this district.

W. B. SPALDING, CAPT., R.A.

CAWNPORE, 26th May 1911.

No. XXVI.—NESTING OF THE CINEREOUS VULTURE (*VULTUR MONACHUS*) NEAR QUETTA.

When I was quartered in Quetta some years ago, I had the eggs of this vulture brought to me on more than one occasion, but I had never myself procured the egg.

This year having heard from a Pathan that he knew of a nest, I made arrangements to go out and see it. April the sixteenth was the date. I started early from my bungalow and drove about 14 miles to the end of the road, and then took to the hills walking; after about three hours up and down hill, we reached the tree on which the nest was placed; this was on old juniper about 40 feet high and 7 feet through at the foot, and was situated on the steep hill side about 8,000 feet above sea level; it was in a very wild place with high cliffs and steep slopes all round it. The nest itself was placed right at the top of the tree, so that the bird sitting on it was visible from a long way off. I climbed up to the nest with some difficulty, as the tree was extremely thick, and when I got to it, I found it by no means an easy task to see into it owing to its immense size; however, I managed it at last and then found to my disgust that there was a young bird in it. I should judge about one week old.

The nest was an enormous mass of sticks, and was lined with smaller sticks, and strips of juniper bark, with a few feathers; the material of the nest would have filled a large cart, the measurements being approximately 3 feet thick at least, and 7 feet across the top, the latter being very nearly flat. The young bird was about the size of a pigeon and covered with black down. The nest and surroundings had an extremely strong and unpleasant musky smell. While I was at the nest the old birds made no attempt to molest me but circled about high in the air above me.

After I had come down from the nest, one of the Pathans, who was with me, said that he knew of a Lammergeyer's nest further up the same ravine; but as it was some way off, I sent him and another man to see if there was any chance of getting at it, arranging to meet them later on. When I did meet them I found that on the way they had found another nest of the Cinereous vulture, also on a juniper tree, and that after some difficulty, owing to the tree being placed in an extremely awkward position, half up a cliff; they had managed to get to it; and brought me one egg from it. The egg was of the usual type, white with rusty red markings all over it, thicker at the large end; these markings were very lightly laid on, and could easily be rubbed off with a wet finger. The egg was rather hard set. The man who climbed to the nest reported to me that the bird had come very close to him; but I think like all Pathans he was only making the most of his exploit.

Not long after the foregoing account was written, at the beginning of May, I was out on a shooting trip on the same hill, and found two more nests of this vulture; they were both situated in similar positions to that already described, at the extreme tops of large juniper trees growing on the hill side in solitary places, about 8,500 feet above the sea; the first nest had an egg in it, a very finely coloured one, but it was so hard set that I could hear the young bird chirping inside it, so I left it; the other had a young bird in it, I should judge about 10 days old.

T. E. MARSHALL, MAJOR, R.E.

QUETTA, 11th May 1911.

No. XXVII.—UNCOMMON BIRDS IN BURMA.

It will be of interest to all ornithologists, but especially those in Burma, to record that on the 29th of May last I procured at "Thandoung," situated on the Karen Hills, about 30 miles East of Tounghoo, elevation about 4,000 feet, a specimen of

The Rufous-bellied Hawk Eagle, *Lophotriorchis kieneri*, No. 1209, F. B. I.—I shot this bird just after it had swooped and carried off one of a party of green pigeons I had been watching feeding on a fruit tree in some heavy

forest. The attack of the eagle was extremely sudden; I became aware of it by hearing a crash in the tree I had been watching and then hearing some large bird flapping its wings and free itself from the branches. This struggle was only momentary, and the eagle flew off heavily with a pigeon in its talons. It perched but a short-way off and I fired at it, never hoping however I was obtaining such a rare specimen. This bird has never, I believe, been recorded from Burma before. I only slightly wounded it, and I found it very troublesome extricating it from some very thick undergrowth into which it had fallen. It was very ferocious and, of course, catching it by the hand was out of the question. The Karen who was with me would not go near it. However in time, manœuvring with a long stick, I managed and got it under control, so as I could kill it without injuring the skin, which I have preserved and will forward it to you, with some other skins I collected at Thandoung for our museum as soon as the rains are over.

Another interesting fact to record is that

Tickell's *Staphidia* (*Staphidia strata*) No. 218, F. B. I., was found to be quite common at Thandoung. Very little seems to have been known about this bird at the time Oates described it. I did not realize how common it was, as it does not make itself at all conspicuous, and might be easily passed over for some other bird until a friend, Mr. Justice Robinson, who was with me in Thandoung collecting eggs, and myself had found about a dozen nests. Robinson did not know the species to which the nest belonged, but thought it was Tickell's *Staphidia* and set all doubt at rest by shooting a parent bird, and I later caught a bird in my landing net on her nest.

I learnt afterwards that I had not noticed the bird Tickell's *Staphidia* itself, as I had passed it over thinking it was a Tit or Flower-pecker. It has very much the same habits, going about in small parties and hunting amongst the leaves and branches for insects and keeping up a continual twittering.

This species in Thandoung invariably chose for its nesting place the banks of paths cut through the jungle, or in one instance I found a nest about 4 feet from the ground in a hole on the face of deep road cutting. The nests are usually cunningly concealed, though at times very conspicuous; generally we found them partially concealed behind a clod or tuft of moss or grass and built into any hole or shelf in the bank, but usually these holes near the top of a bank were chosen, so that the overhanging moss clods, etc., partially concealed it.

The nest is rather massive for such a small bird, being thickly walled with moss and rather loosely packed. The inside is a neat cup, lined with very fine grasses and their black stalks so very thin that they have the appearance of horse hair, obtained, I fancy, from the smaller clued ferns.

None of the 7 nests I found between May 14th and 29th contained more than 3 eggs, and the eggs in all were fresh. One bird began laying on the 21st May. Nine eggs in my possession measure $\cdot 8 \times \cdot 6$ and are white speckled with brown but the distribution of the spots varies a good deal. Some of the eggs have a regular zone of small spots round the larger end and spotted very sparingly elsewhere, others are spotted uniformly over the whole egg.

J. P. COOK.

THAYETMYO, 14th June 1911.

No. XXVIII.—FALCON AND GULLS.

The other evening while on the harbour, I noticed a large number of gulls of the two common kinds here (the sooty and the small grey) flying in a state of great excitement.

Thinking they were over a shoal of fish, I put a telescope on to them and was surprised to see that the cause of the excitement was a falcon of the kind we know here as one that chases the wild pigeons. I suppose it is either the peregrine or laggar. One of these birds was attacking a grey gull with the utmost fury and drove it again and again into the water, where it hovered over the gull with its talons extended as if about to alight on it. Then the whole army of gulls would sweep down and carry away the falcon in the rush: the gull that was the object of the falcon's attentions would then rise and endeavour to join its companions and escape but the falcon extricating itself from the crowd repeated his attacks several times always driving the gull into the water whence he seemed unable to drag it. The gulls by repeated rushes eventually got their friend safely off and I saw the falcon fly straight away over the harbour to Shaik Othman. The two points that impressed one were the state of utter fatigue and weakness to which the falcon had reduced the gull by his pursuit, though one knows the great strength and wing endurance power of the gulls. I suspect that being overdriven for pace produced the distress. The second point was the unerring manner in which the falcon, when he came out of the scrimmage of gulls went straight for his victims seeming to know exactly where he should find it. I have seen the same thing when these falcons chase pigeons: their pursuit is relentless, and I should imagine generally successful; the gull would certainly have been killed had his companions not swept down on the falcon in the way they did and had he not been able to take to the water. Is not this a very uncommon circumstance? I should be glad to know, if such an attack has previously been observed.

S. E. PRALL, LT.-COL., I.M.S.

ADEN, August 1911.

No. XXIX.—NESTING OF THE OSPREY OR SEA-HAWK.

Some three years ago I found a nest of these birds on Round Island, a lonely rock about 100 feet high on the seaward side of Aden. I have however not been able to make out when the rearing of the young takes place. The weather is too rough to permit of the landing on the rock throughout the year, so I suppose that like the vultures that breed on the cliffs here, the young were reared in the monsoon months. This year however a new nest has been built in the month of December at least, that is when I first saw it. I enclose a photo* of the rock and the two nests which are both on the top ridge and built of sticks brought from the Shumshum valley just opposite. I have never seen more than one pair of birds at this place, so conclude they are the same; there are several pairs fishing in and around the harbour and they are so tame that they will allow you to approach quite close in a boat. From observations made with glasses in this way and from fish picked up under the nest I note that when the osprey has taken a fish he places it longitudinally between his feet on arrival at his perch and commences at the head.

He will often throw the fish away after eating the head only, the small ribbon fish is one he often catches and to judge from what we have picked up under the nest throws it away after eating the head. I admire the discrimination shown as the ribbon fish is a mass of bones and altogether impossible.

S. E. PRALL, LT.-COL., I.M.S.

ADEN, August 1911.

* [The photo was too small for satisfactory reproduction.—EDS.]

No. XXX.—EUROPEAN GREAT BUSTARD IN CHITRAL.

On April 10th Captain R. A. Lyall forwarded us a skin of a Great Bustard, *Otis tarda* which had been shot by Lieut. Stirling on 30th March. In a letter accompanying the skin Capt. Lyall remarks "I found that the Chitralis had got a name for the bird (dio dagh) though it was said to be very rare." The skin is that of an immature female with the pectoral band only showing slightly at the sides and not so distinct in Captain Simond's specimen.

N. B. KINNEAR.

BOMBAY, April 1911.

No. XXXI.—WOODCOCK IN KULU.

In Mr. Stuart Baker's article on the Woodcock, *Scolopax rusticola* in Vol. XX he states on page 15, four lines from the bottom, that: "the largest

bag on record for India is that recorded by A. Graham Young in Hume and Marshall's *Game Birds of India*, 28 years ago. This bag was made in Tos Forests in Kullu." Now Mr. Graham Young never said that the bag of 33 cock was shot in the Tos Forests; all he said was that they bred in the Tos Forests and descended lower down in the autumn. Tos is the silver fir which grows at an elevation of 8-10,000 feet.

In the winter cock come down to the alder, Koish (or *Kosh*) groves in the valley, and there they are shot easily. It is rare for one gun to bag 8 cock in a day in Kulu now.

J. COLDSTREAM, I.C.S.

KULU, 10th February 1911.

No. XXXII.—OCCURRENCE OF SWINHOE'S SNIPE (*GALLINAGO MEGALA*) AT MYITKYINA, UPPER BURMA.

The following note may be of interest as a record of *G. mekala* within the area dealt with in the Fauna of British India. The specimen was one of three snipes shot here by a friend on 5th January 1911 and sent to the writer, who in examining them recognized this one as Swinhoe's Snipe.

The following notes were made at the time:—Length 11.75 inches; wing 5.6; tail 2.27; bill 2.78; tarsus 1.35. Tail feathers 20, the eight median ones broad, six lateral ones on either side, much narrower but not nearly so narrow as the Pintail's. Iris chestnut. Legs and feet bluish plumbeous. Centre of abdomen white. Narrow white tips to primaries and secondaries. Distance between tip of shortest secondary and that of longest primary 2.6 inches.

F. E. W. VENNING, CAPT.

PYAWBE, BURMA,
August 1911.

No. XXXIII.—OCCURRENCE OF THE FANTAIL SNIPE
(*GALLINAGO CÆLESTIS*) IN SIAM.

In the last number of the Journal, in the interesting account of the Common or Fantail Snipe, forming part of the series of "the Game Birds of India, Burma, and Ceylon," by Mr. E. C. Stuart Baker, I notice on p. 552 of the Journal, the following statement—"I have lately received a specimen from Siam whence it had not previously been recorded."

This statement shows how local knowledge may be left unrecorded for years, in this case probably, on account of its being such common knowledge. The fact is the occurrence of the Fantail Snipe in Siam must be known to practically every sportsman who shoots there and there are a good number especially in Bangkok.

During a three years' sojourn in Siam between the years 1901-04 I kept a fairly accurate account of my bags, which I herewith append. I fear I did not in every case distinguish between Fantail and Pintail, but certainly on sufficient occasions to show that the Fantail is by no means a rare bird in Siam.

Here is the record taken from my game book:—

			Locality.	
Dec. 9th 1901.	3 Fantail Snipe, 1 Painted Snipe,		Augtug,	Siam.
„ 11th „	2 „ „		Parudan	„
„ 18th „	2 „ „		Pétronuloke	„
„ 22nd „	8 „ 1 Painted Snipe		„	„
„ 25th „	12 „ „		„	„
Feb. 22nd 1902.	1 „ „		Promptiram	„
March 24th „	9 Fantail and Pintail Snipe,		Sawankoloke	„
Sept. 14th „	7 Pintail Snipe,		Bangkok	„
„ 20th „	5 „		„	„
„ 21st „	16 „		Bangsue	„
„ 27th „	23 „		Bangkok	„
„ 28th „	70 „		„	„
Oct. 4th „	6 „		„	„
„ 5th „	50 „ and 11 Fantail,		Bangsue	„
„ 10th „	41 „ and Fantail		„	„
„ 11th „	10 „		Bangkok	„
„ 26th „	27 Snipe (mostly Fantail)		Bangsue	„
Nov. 3rd „	20 „ (only 5 Fantail)		„	„

The birds shot in December 1901 were obtained on my way up the Menam to Petronuloke where I was stationed for nine months, and do not represent any organized snipe shooting.

In and around Bangkok, especially at Bangsue, two or three stations up the line, the shooting is extremely good, and not exhausting work, the ground being chiefly paddy fields either cultivated or waste with only six inches of water or even less, so that one is seldom more than ankle-deep in mud and water. Snipe shooting in Bangkok commences about the second week of September when the Pintail begins to arrive, the Fantail not putting in an appearance until a month later. I note this agrees fairly well with the dates given on the two charts A and B included in the accounts of the two birds.

D. O. WITT, I.F.S.

SAUGOR, 17th May 1911.

May I ask you to let me know to what species of snipe the enclosed wing and tail belong. They seem to me to be those of the Fantail snipe, but

Mr. E. C. Stuart Baker, in his article in the last number of the Journal, say only one specimen has been recorded from Siam. This bird was one of several of the same kind shot here on the 27th February last.

W. J. F. WILLIAMSON.

KINGSDON, BANGKOK, 5th March 1911.

[The wings and tail sent were certainly those of the Fantailed Snipe (*Gallinago caelestis*), but whether they belonged to the race *raddei* or not, it was impossible to say.—EDS.]

No. XXXIV.—SNIPE SHOOTING IN UPPER BURMA.

After reading Mr. Stuart Baker's article on Snipes in the January Number of the Journal, I should like to send you a few notes of my own on the movement of birds in the dry zone of Upper Burma.

In 1904 on Sept. 13th near Yindaw (Yamethin District) Major G. E. T. Green and I heard snipe crying overhead and looking up saw two snipes on the wing.

In 1905 I was in England.

In 1906 on Sept. 19th near Tangu (in the S. E. corner of the Myingyan District) when out quail shooting with Mr. F. B. Leach I heard a snipe cry, and saw a single snipe on the wing overhead out of shot.

In 1907-1908, 1909, I have no note owing to illness and absence. In 1910 on Aug. 16th at Allammyo (near Thayetmyo) I heard a bird crying over-head and saw a single snipe on the wing. In none of these instances could I shoot or bring the bird to bag; but in each case my attention was caught by the unmistakable snipe cry before I saw the bird.

The first and last birds shot in each year, unfortunately I have not recorded. Fantails and Pintails were—

1906	.. Myingyan District	.. March 10th	.. Latest.
"	"	"	.. Nov. 18th .. Earliest.
1907	..	"	.. March 4th .. (Latest, but I put up two probably Pintails, on a dry hillside on March 14th).
"	.. Pegu District	.. Oct. 6th	.. Earliest.
1909	.. Myingyan District	.. Nov. 25th	.. Earliest.
1910	..	"	.. Feb. 25th .. Latest.
"	Thayetmyo District	.. Sept. 24th	.. Earliest.
1911	..	"	.. Feb. 20th .. Latest.

With reference to Mr. Stuart Baker's query on p. 557 as to whether Snipe Shooting is harder in England than in India, I have the following notes on some snipes which I kept under observation in a small swamp in

Somersetshire in Dec. 1908. There was usually a wisp of 7 birds, which were abnormally wild and whether I had a gun or not, rose at 80 yards if I approached them over the frozen ground, but if I walked down over soft snow or in the ooze of a small stream that ran out of the swamp, I could usually get within 40 yards, whether with a gun or without. I came to the conclusion that the hard ground round this tiny swamp acted like the sides of the basin and transmitted the vibration waves across it. In Burma I have noticed, too, that snipe will be close for a barefooted native than for a shooting boot, and are far wilder for a shooting boot on a semi-solid kazin (or field-bund) than for the same boot in mud and water.

The English bird is the Fantail, which according to Mr. Stuart Baker (p. 592) has a more sensitive bill than a Pintail, so that this vibration theory might explain why the English bird is wilder and also why Pintails often lie so close when found among dry grass on solid ground. But it would also remain to be proved whether the Fantail normally rests with his bill in contact with the water.

I put forward the theory tentatively, and am prepared for destructive criticism from more experienced sportsmen.

E. N. BELL.

ALLANMYO, BURMA, 8th March 1911.

No. XXXV.—THE OCCURRENCE OF A "BOOBY," *SULA CYANOPS* (♀) AT CANNANORE.

My compound here ends abruptly in sea cliffs, and yesterday my servants killed a bird, which I take to be *Sula cyanops*, as it was sitting on the ground at the edge of the cliff. It was a young female, and the following is the description of it:—Length 31, wing 15·5, tail 7·5, tarsus 2·25, bill from gape 5·25.

Legs and feet, face to behind the eyes, chin and soft underparts of lower mandible, blue grey, nails of toes white. Bill bluish grey, paling to white at the tip and along the cutting edges, both mandibles feebly serrated, upper mandible longitudinally furrowed, irides pale lemon yellow.

Head, neck and upper back white with numerous small brown spots. Lower plumage, except the sides and thighs, which have a few brown spots, pure white, upper plumage from upper back, and the wing covert brown tipped and edged white, wings blackish brown, tail brown, secondaries and tertiaries brown, centred black and the basal portion white.

I shall be glad to know what *Sula* it is, for "Booby" it is, and Booby it was to have allowed itself to be hit over the head with a stick! I imagine it must have been driven there far out of its usual haunts by the heavy gales we have experienced lately, and although in splendid

condition and feather, exhaustion may have been the cause of its falling such an easy victim.

I have not seen any similar birds down in this part before, nor does Dewar mention the *Sula* among the birds of Madras.

H. R. BAKER, MAJOR.

CANNANORE, 20th July 1911.

[From the above description there appears to be no doubt that the bird is a masked booby, *Sula cyanops*. An example was caught at the new Docks, Bombay, in August 1909.—EDS.]

No. XXXVI.—THE OCCURRENCE OF *CYGNUS BEWICKI* AND OTHER SWANS IN INDIA.

During the cold weather of 1910-11, the exceptionally cold wave which occurred in Northern India during the months of November, December and January had the effect of sending us a large number of rare visitors amongst which Swans have been prominent.

No less than four of these—two beautiful skins and two heads—have been sent me from our Society, together with other rare birds, that I might have the pleasure of inspecting and noting on them. The most important and interesting of the swans is a beautiful female, correctly identified as *Cygnus bewicki* by Major P. C. Elliott-Lockhart, who shot it on the 30th December 1910 near Maidan on the North-West Frontier. He records the length as 3 ft. 9 in. and the weight as 12 lbs.

To these notes the following measurements should be added:—wing 20·0", Bill, from top to cere along culmen 2·18" and to edge of feathering 3·51", along commissure to gape 3·32"; tarsus 3·32".

Attention should here be drawn to the fact that Salvadori's measurement of the tarsus, 4·8", as given by me on p. 14 of Vol. XI of the Journal, is a mistake for 3·8". I do not think the tarsus of this little swan is ever much over 4·0" if measured from joint to joint at the side.

A second specimen of *Cygnus bewicki* was obtained by Mr. Hornsby on the 2nd January; this is a magnificent male, and has a bill which upsets all previous theories as comparative measurements between this and other species of Swans.

The dates given on the ticket are "Tubi, Campbellpur." Measurements after skinning, expanse wing 77½", length wing 21", length 59".

The bill of this bird measures no less than 4·2" from tip to edge of feathering, a full 3" longer than I have seen in any other specimen of *bewicki*, but the colouring is very typical of that species. The lores and immediately adjacent parts seem to have been bright yellow when fresh, deepening to an orange yellow where this colour meets the black. This

latter extends over the whole of the bill in front of the nostrils and thence back on the culmen to within half of an inch of the cere and along the commissure up to the extreme gape. The bill in comparison with its length is decidedly slender, being only in depth at the base. The measurement of the wing now dried is 20·7" and that of the tarsus from joint to joint 3·95".

The two swans' heads sent by Major Magrath belong to very immature specimens of *Cygnus musicus*, both are undoubtedly birds hatched in 1910, and are practically still cygnets; for it must be remembered that swans take about three years to attain their full size. With the two heads Major Magrath sends the following notes.—"I send herewith the heads, bills and skins of the heads of two swans shot out of a small herd of seven by Mr. M. Donlea, Inspector, N. W. F. Police, on the 10th December, near Dheri Momim, on the Kabul River. The birds, one of which was shown me in the flesh were immature. The one I inspected had a greyish brown head and neck, the rest of the body being white and the legs black. *The culmen for more than half the way down the mandible was of a bright pinkish hue and the base of the bill and bare loreal space to within about half an inch of the nostrils was pale fleshy in colour.*" (The italics are mine.)

The measurements of the bills of these two cygnets are—from tip to edge of feathering 3·15" and 3·17" and from tip to eye 4·2" and 4·4", width at broadest part 1·24" and 1·22". In both these birds the pale colour of the bill extends down the top of the culmen well past the nostrils.

E. C. STUART BAKER,

F.L.S., F.Z.S., M.B.O.U.

No. XXXVII.—UNCOMMON BIRDS IN THE UNITED PROVINCES.

Common Sheldrake, *Tadorna cornuta*.—On January 22nd two common Sheldrakes were seen on a jheel close to the Ganges near Fatehgarh, and one was obtained some weeks later. On 20th February six were seen feeding on the edge of an open tank in the same district. According to *Indian Ducks and their Allies* this duck is only a rare visitant to Oudh.

Goosander, *Merganser castor*.—Two females of this duck were shot on 28th January close to Cawnpore on a jheel which was dry except for three or four small pools of water. I have seen these birds feeding at the mouths of rivers in North China but never in shallow stagnant water. No one in my Regiment had ever seen one anywhere before in India.

Great Indian Bustard, *Eupodotis edwardsi*.—Three birds of this species were seen near Orai in the Jalaun district, but none of them were obtained. They were feeding close to a herd of Blackbuck and in the distance we took them for buck, as they showed up black and white.

A Goose was obtained out of a large gaggle near Handoi. It was practically black with a speckled breast, small in size, but bigger than and essentially different from a Sukta. No one was able to name it.

M. A. GUDLESTONE, CAPTAIN,
41st DOGRAS.

CAWNPORE, 10th April 1911.

No. XXXVIII.—NIDIFICATION OF THE LITTLE GREBE OR
DABCHICK (*PODICEPS ALBIPENNIS*).

For the past two years I have been watching several birds of the above species on the marshy ponds between Grant Road and Mahalakshmi stations of the B. B. & C. I. Railway, particularly with regard to their breeding habits as they appeared to be building all through the year.

From the several books I have on Ornithology it appears that ordinarily May to September are the months in which nests should be found; but I have taken three nests outside these months at very wide 'dates. Hume says it breeds at very different seasons according to locality. The earliest dates I find recorded are in Hume's "Nests and Eggs of Indian Birds" in which Mr. W. Theobald remarks: "Lays in the second week of May"—this was in the valley of Cashmere. In the same work Mr. Davison says it breeds on the Ootacamund Lake in May. The latest date recorded is by Mr. H. Wenden who, on 26th October at Goolburga Fort, found a nest containing five eggs.

I took a nest with five eggs on the 31st March, two of which had not been long laid, as they were lighter than the others which were the usual smoky brown. I took another on the 16th November containing four very fresh eggs, the last of which could only have been laid just prior to my taking the nest as it was white with a faint bluish-green tinge. But to my surprise I noticed a pair of birds building in December last, and decided I would wait till the last day of the month before I took the nest which I did, and found three much incubated eggs. The nests were of the usual kind—no construction—merely masses of decomposed weeds apparently resting or attached to some water-grass, and had a very offensive odour. Hume says: "I doubt whether the birds sit much during the day....." I almost invariably found the old bird sitting, and when approaching the nest it was interesting to watch the bird cover up the eggs with that marvellous dexterity, for which the species of this genus are noted, and then quietly slip away and disappear into the water, but as I once noticed, watched what my coolie was doing with its head just above the surface as a snake's would be.

JOHN FRY.

MAHIM BOMBAY, 11th April 1911.



No. XXXIX.—RECOVERY OF BIRDS FROM INJURIES.

On 31st December 1909 while snipe shooting, with a friend, I noticed a Cattle Egret (*Bubulcus coromandus*) sitting alone on the edge of a swamp. Other egrets were sitting and moving about, but at a little distance from this one which appeared to have a stick protruding from its back. Immediately I moved towards the bird, it flew away and its appearance with a mast erect between its wings was quaint. Thinking the bird must be suffering, I called to my companion to shoot the bird which he did.

The Karens use cross-bows a great deal and some attain a marvellous degree of accuracy with them. This bird, however, was in all probability shot by a fluke while flying. The arrow was of the usual type used for shooting at birds and small mammals—bamboo with hardened point. It was some 20' in length; had penetrated and passed through the abdomen, its exit being through the sacrum a little above the ischiatic foramina. About 16" of the arrow had passed through the body, we found that the bird must have

received the wound long time previously, as it had healed perfectly, the arrow was more or less firmly fixed; we took the bird to Rangoon to show to persons interested and to have a photograph taken, after which we plucked it and found the bird in good condition; the plumage was clean and bright.

In this connection it is quite astonishing how birds do recover from injuries I had a tame Koel (*Eudynamis honorata*). One night a cat managed to break into the cage, fortunately the bird made such a noise that a servant came and rescued it, but not before it had received severe injuries. When I saw it I wished to destroy it; but the servants implored me to give it a chance, and they would treat it. The bird recovered. It is interesting to examine bags of snipe, as one often meets with extraordinary cases of recovery from fractures, caused by shot, of the femur, tibio-torsal bone, etc.

G. H. EVANS, LT.-COL.

LAHORE, 18th April 1911.

XL.—HABITS OF THE PYTHON (*PYTHON MOLURUS*).

In "Forest Life and Sport in India"—(Eardly-Wilmot)—as to the attack of the Python on its prey, the Author writes:—"It may therefore well be the case that the blow of a heavy python would be sufficient to stun a passing deer until it could be enfolded in the grip of the snake, and that this method of hunting may supplement the sudden and more deadly attack from overhead."

In reference to these remarks, the following notes are interesting. A few years ago on one of my many visits to Jamrach's collecting Depot, in Entally, Calcutta, Scott, the Manager, showed me with great pride, an enormous python in a box, length between 21 and 22 feet. I asked Scott how such a huge brute was captured? He told me that two of his collectors were in the Khasia Hills looking out for captives. One of the men when high up in a tree making his way to a nest happened to look down and saw this python hanging from a branch, slowly swinging with its head a few feet from the ground. The man said he was very frightened and made not a move. All at once the python became rigid; by and by the bird-nester heard the rustle of leaves not far off and recognized that it was the foot-path of his fellow collector, by whistling he was able to signal to him to give the tree a wide berth. Soon the snake began swinging very slowly, then it again became rigid, and the light patter of a deer was heard and a barking deer came in view and within striking range of the python "when like a shot it was sent flying:" and there it lay almost motionless. In a little the python got down to the ground and glided over to, and lay on, the deer. In a short time the operation of swallowing began. During the process of swallowing, the two men made a basket, and when the snake had resigned itself to rest, the basket was worked over it and the making of it completed:

over this another basket was made, and in the double basket it reached Calcutta. The men said they had no trouble in getting it into the basket.

W. FORSYTH.

PEN ITHON HALL, NEWTON, N. WALES,
15th June 1911.

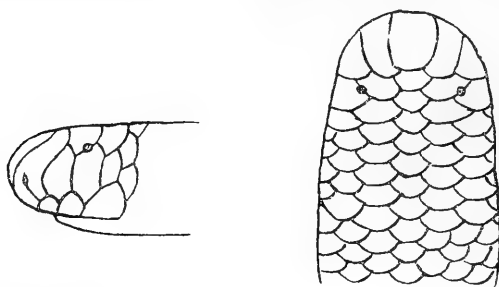
NO. XLI.—REMARKS ON TWO RARE BLIND SNAKES.

In examining the blind snakes (*Typhlopidae*) in our Society Museum, I have come across two that are worthy of remark.

T. porrectus. (Stoliczka.)

There is a single specimen of this species from Poona, which does not quite accord with Jan's figures of the type. Further Boulenger's description (Cat., Vol. 1, p. 19), judging from this specimen would bear amplification.

I would describe it as follows :—*Rostral*.—Not reaching level of eyes. *Nasal*.—Not meeting behind rostral; semi-divided, the suture passing to the 2nd labial. Head covered with shields slightly larger than those on the body. Of those there are 8 in the median line, 9 on either side, the anterior 2 of the latter (the *supraocular* and *parietal*) being rather broader than the succeeding 5. (Jan shows 4 median and 3 lateral shields enlarged). *Præocular* touching 2nd and 3rd labials; subequal to ocular. *Ocular* touching the 3rd and 4th labials. *Temporal* one (Jan shows three). *Costal* 17, (not including the ventral row) in whole body-length. Snout rounded. Eye black and very distinct (Boulenger indistinct), small, lying beneath the suture between the supraocular and ocular shields. Length 133 mm. Breadth $\frac{1}{58}$ the total length (Boulenger $\frac{1}{70}$ to $\frac{1}{90}$). I append figures.



T. mackinnoni (Wall.)

This species has been till now known only from a single specimen collected in Mussoorie, now in the British Museum. In our Society's collection I find one labelled *porrectus* with no record of locality. It differs from the type in that the rostral does not quite reach the level of the eyes. In length it is 185 mm. The literal breadth is $\frac{1}{46}$, the total length, agreeing

in this as in other respects with the type. The costals are 17 (not including the ventral row) in the whole body-length, not 19 as stated in error in the original description (Bomb. N. H. Journal, Vol. XIX. p. 805).

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 13th March 1911.

No. XLII.—ON THE OCCURRENCE OF THE SNAKE *DIPSADOMORPHUS NUCHALIS* (BEDDOME) IN BERHAMPUR ORISSA.

In the records of the Indian Museum (Vol. III, pp. 151, *et seq.*) I remarked upon certain forms of *Dipsadomorphus* hitherto included under the name *D. ceylonensis*, four of which combined certain characters, making it appear that each form deserved recognition as a distinct species.

One of these forms, *viz.*, *nuchalis* (Beddome) I showed by a series of 16 specimens combined the following characters:—(1) scales 21 (rarely 23) in midbody, (2) 234 to 251 ventrals, (3) 90 to 108 sub-caudals, (4) Habitat—Hills in Western India and Nepal.

I have recently had a specimen in complete accord with this type from Berhampore (Orissa), which is specially interesting, because it links up the previously known curiously distant habitats. The specimen has 21 scale rows in midbody, 244 ventrals, and 108 sub-caudals. The vertebral scales are nearly as broad as long. The colour is a darkish grey, and there are obscure blackish oblique bars costally.

It is still further interesting in tending to support my views, which Dr. Annandale attacked in the succeeding number of the Journal above referred to.

As far as I am aware, none of the forms I referred to have been reported from Hills on the Eastern side of India, so that, whether these forms will eventually be recognised as varieties of one species or species distinct from one another, it is interesting to know that one form at least inhabits the Eastern side of Peninsula India. I think it a safe assumption that the specimen I have just acquired is a wanderer from the adjacent Hills which are but 8 or 10 miles distant.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 6th April 1911.

No. XLIII.—IS *LYCODON GAMMIEI* (BLANFORD) AN ABERRANT SPECIMEN OF *LYCODON FASCIATUS* (ANDERSON)?

I was much interested to see in the last Journal (p. 855) the snake *Lycodon fasciatus* recorded from exactly the same locality in the Eastern Himalayas, in which *Lycodon gammiei* was collected, especially as I have

for a long time thought the latter would prove to be an aberrant example of the former.

The type and only specimen of *gammiei* is in the Indian Museum, and when I examined it some years back, I remarked on the great similarity in colour and lepidosis between it and *fasciatus*, and was inclined to think the two would probably have to be united. I was deterred from voicing this opinion firstly, because *fasciatus* had never been recorded from the Eastern Himalayas, and secondly, on account of scale differences. Now that the first objection to my opinion has been removed, it is worth enumerating the scale differences noted.

(1) First there is the fact that there are in *gammiei* 19 scales in midbody whereas in *fasciatus* there are 17. (2) The ventrals and sub-caudals in *gammiei* are in excess of the ranges given by Mr. Boulenger (Cat. Vol. I, p. 358) for *fasciatus*. (3) The loreal in *gammiei* fails to touch the eye, but in *fasciatus* it usually does so.

To take the scale rows in *fasciatus*, they are 17 shortly behind the neck, and remain so to well behind the middle of the body, then reducing to 15. In *gammiei* they are 17 for about 6 headlengths behind the head, then become 19 by a division of the 3rd row above the ventrals, and remain 19 till behind the middle of the body where they reduce to 17 and subsequently to 15. Now it is no unusual thing to find individuals in many species that exhibit the same anomaly (as I believe this is); the scale rows for a variable length in the body exceeding the normal by two. I have seen this in more than one species of *Dipsadomorphus*, *Oligodon* and *Simotes* in *Silybura ocellata* *Ancistrodon himalayanus* and other snakes. The peculiarity of the scales in *gammiei* need not therefore deter one from considering it an aberrant *fasciatus*.

As regards ventrals and subcaudals, Mr. D'Abreu reports the counts in his specimen as 214+98, thus according well with those in the type of *gammiei*, which Blanford recorded as 214+101. (I however make them 222+100).

With reference to the third point, Mr. D'Abreu mentions that the loreal is pointed behind (he says anteriorly, but obviously means posteriorly), but does not reach the eye. This is the exact condition in the type of *gammiei*.

I examined the type of *gammiei* beside specimens of *fasciatus*, and in every detail except those referred to above, the two forms seemed to agree. The colouration is exactly as in *fasciatus*. I feel very confident now that *gammiei* is an aberrant example of *fasciatus*, and as it was described first, the species should in future be known as *gammiei*, Anderson's name *fasciatus* being suppressed.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 1st March 1911.

No. XLIV.—DO SNAKES SWALLOW STONES ?

The other day, while examining the insides of a large *Tropidonotus piscator*, I found a solid piece of mortar, measuring about an inch by three-quarters and half an inch in thickness. It would appear that snakes like crocodiles and birds swallow stones to aid their digestion. I would like to know if other members have noticed similar incidents.

E. A. D'ABREU, F.Z.S.

NAGPUR, C. P., 27th August 1911.

No. XLV.—REMARKS ON THE GREATER, AND LESSER
BLACK KRAITS (*BUNGARUS NIGER*,
AND *B. LIVIDUS*).

Having just received two specimens of that uncommon and local Krait *B. lividus* from Mr. D. A. Jacob, I.F.S., from Jalpaiguri District, I think some remarks on this species and its near ally *B. niger* may be of interest. The lesser black Krait (*lividus*) was described originally from Assam by Dr. Cantor in 1839, but its validity as a species was doubted and Dr. Gunther in 1864 merely conceded to it the rank of a variety of our common Krait (*cæruleus*). Later, however, in 1890 Mr. Boulenger restored to it its lost dignity as a species, and I think most herpetologists will agree with his view.

Until last year it was confused with another very similar Krait which I described in this Journal* as a distinct species under the name *B. niger*.

The two, though inhabiting the same restricted area, are easily known from one another by the development of the vertebral row and the ranges of their respective ventral and subcaudal shields.

In *lividus* the breadth of the vertebrals does not exceed their length, and in this it differs from all the other Kraits up to date described. Those shields appear longer than broad, but if accurate measurements are taken they will be found usually to be as broad as long. I believe it is a decidedly smaller snake than *niger*. It is poorly represented in our Museums, there being but four in the British Museum; none in either the Indian Museum nor our Society's Collection.

Both snakes are uniformly black dorsally, with a greyish or bluish sheen in certain lights. In the young of both there is no præocular white spot, nor blotches of white on the occiput as is usual, if not always the case, in the common Krait (*cæruleus*). The belly is alike in both being white for a variable length in front, later becoming mottled with dark plumbeous especially in the bases of the ventral and subcaudal shields.

I have now examined 12 specimens of *lividus*, and the details of these are shown in tabular form for easy reference, and comparison with 19 specimens of *niger* I have examined.

* Vol. XIX, p. 838.

I have the jaws of the largest specimen referred to and a complete skull of a Jalpaiguri specimen, and the dentition shows fewer teeth in the mandibles than in *niger*, of which I have five skulls. In both species there are three small grooved teeth in the maxillar behind the pair of fangs. In *lividus* the palatine teeth are 9, pterygoid 7 to 9 and the mandibular 12. In *niger* the palatine are 9 to 13, pterygoid 8 to 11, and mandibular 15 to 18.

I could gain no information in Assam about the poisonous effects of the bite of *niger*, but was more fortunate in obtaining information about *lividus*. A planter near Tezpur had a cooly woman bitten by one, and she died some 12 to 18 hours later. The specimen was killed and kept, and submitted to me for identification. It measured 3 feet 2 inches, and was much the largest I have seen. No medical details of this case were kept unfortunately.

BUNGARUS LIVIDUS.

	Length.	Ventrals.	Subcaudals.	Total Vent. and Subc.	Habitat.
1	....	215	37	252	Assam. In Brit. Mus.
2	....	214	38	252	Do. do.
3	....	212	36	248	Do. do.
4	....	212	42	254	? do.
5	3' 2"	215	37	252	Madopu. near Tezpur Assam.
6	1' 6"	209	37	246	? In St. Joseph's College, Darjeeling.
7	2' 0"	212	36	248	Tindharia, E. Himalayas.
8	1' 6"	212	38	250	Do.
9	1' 1 $\frac{3}{4}$ "	211	35	246	Do.
10	1' 1 $\frac{1}{4}$ "	212	39	251	Jalpaiguri District.
11	1' 10 $\frac{3}{4}$ "	217	40	257	Do.
12	1' 6"	215	41	256	Do.

BUNGARUS NIGER.

	Length.	Ventrals.	Subcaudals.	Total Vent. and Subc.	Habitat.
1	....	224	50	274	Garó Hills, in Indian Museum.
2	....	231	47	278	Sibsagar, Assam. In Indian Museum.
3	2' 9"	225	53	278	Dibrugarh, Assam.
4	3' 4 $\frac{3}{4}$ "	229	54	283	Do.
5	2' 5"	224	52	276	Do.
6	4' 0 $\frac{1}{2}$ "	216	51	267	Do.
7	3' 3 $\frac{1}{4}$ "	223	53	276	Do.
8	3' 10 $\frac{3}{4}$ "	221	55	276	Do.
9	3' 8"	222	51	273	Do.
10	4' 0"	?	?	?	Pashok, E. Himalayas.
11	1' 2"	221	51	272	Do.
12	3' 6 $\frac{1}{2}$ "	225	48 ?	273	Do.
13	....	224	55	281	Do.
14	4' 0"	231	57	288	Pashok or Tindharia, E. Himalayas.
15	1' 3 $\frac{1}{4}$ "	224	57	281	Do. do.
16	3' 5 $\frac{1}{2}$ "	225	57	282	Tindharia, E. Himalayas.
17	....	223	54	277	Do.
18	....	225	56	281	Do.
19	....	226	53	279	Namsang, near Jaipur, Assam.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 16th June 1911.

No. XLVI.—LARGE COMMON AND BANDED KRAITS.

I send herewith the measurements of what I think must be a record Krait, variety, *Bungarus cœruleus*; it was killed at Hazaribagh last year by Major F. Stevens, I.M.S., the Civil Surgeon, who kindly sent it over to

me on June 1st, 1910. I think this is worthy of publication in the Journal. Length 4 ft. $6\frac{3}{4}$ inches; tail $7\frac{1}{2}$ inches; scale rows 15; ventral scales 215; sub-caudals (entire) 50; anal entire; sex male; weight a little over 12 oz. First complete double white ring (or bars) commences about 11 inches from snout. Length of claspers about half an inch each. Colour ordinary plumbaceous madder brown, white of vent slightly yellowish.

Mr. Hayes, a Mine Manager, killed a Banded Krait (*Bungarus fasciatus*) a little while ago some miles from Koderma, E. I. Ry., which measured 7 ft. in length.

O. A. SMITH, MAJOR, 27th PUNJABIS.

KODERMA, E. I. RY., 19th July 1911.

NO. XLVII.—THE DEVELOPMENT OF EMBRYO IN THE EGGS
OF THE OVIPAROUS VIPER, *LACHESIS MONTICOLA*,
PRIOR TO OVIPOSITION.

I am sending you some eggs I removed from a gravid *Lachesis monticola* that was killed in Shillong in July this year. They are specially interesting, because they contain as you will see embryos.

The fact that this viper is oviparous has been known since 1904 when our Society received deposited eggs containing embryos about six inches in length from Mr. G. A. Millar, St. Joseph College, from Kurseong. The observation has been confirmed by the Revd. C. Leigh who wrote a most interesting article on this snake in the *Field* (1st January 1910). He mentions therein two clutches of deposited eggs, but though he adds three records of eggs removed from gravid parents after death, he does not allude to any of these containing embryos.

The parent snake in my case measured 2 feet 2 inches. She contained 7 eggs, 4 in one ovary, and 3 in the other. These eggs were flattened where the poles met in opposition, and measured about $1\frac{3}{8} \times \frac{7}{8}$ inches. When cut open I found an embryo coiled up in a chamber at the side of the yolk lying just beneath the ovicular membrane. The head was distinctly observed with a large boss at the back (primary cerebral vesicle). The eye is distinct, the upper jaw slightly beaked, and the mandibles much shorter than the latter, and not joined symphysially. The heart is distinct, and the whole foetus measures a shade over one inch unravelled. How much longer these eggs would have been retained it is impossible to conjecture, but it is probable that the embryos may grow larger before the eggs are ripe for discharge.

The condition of the egg and embryo is exactly that recorded by me in this Journal with regard to the snakes *Typhlops diardi*, *Dendrophis tristis*, and *Dendrophis proarchos*.

I think it is a pity the word ovoviviparous is not used exclusively to denote this type of egg, retaining the word viviparous for fœtal birth, and oviparous for eggs with no trace of Embryos.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 7th August 1911.

No. XLVIII.—A SPORTING KASHMIR FISH, THE CHEROO—
SCHIZOTHORAX ESOCINUS.

Of the fishes native to Kashmir which remain with us throughout the year I think this fish must take the premier place. Among European visitors to the Valley it is known as "Cheroo," but the more discriminating gar hanjee gives this name only to the male fish, the female being known to him as the "paket gar." The scientific name indicates predatory habits and as with many other predatory creatures such as hawks, eagles, spiders, etc., the females of this species greatly exceed the males in size and strength. One season at Ganderbhul, where the Sind river debouches from the hills into the Kashmir valley, I heard of two hen "cheroo" of over 20 lbs. being taken with the rod (both full of ripe ova) but I have never heard of a cock fish being caught over 6 or 7 lbs. weight. The spawning season is from March to June and it is only at this time of the year that "cheroo" are to be found out of the lakes and sluggish waters of the Jhelum. Even then they rarely ascend very far into the more rapid waters of the hill stream but take advantage of the first convenient gravel beds to deposit their ova. The egg is about one-fifth or sixth the size of a trout egg and roughly I should guess the deposit of a hen fish of 20 lbs. weight to be over 100,000 ova. Formerly many more "cheroo" fell to the rod and line in Kashmir than is the case to-day and as a rule those now caught are taken in the spawning season when they give little or no fight. Even a big fish foul-hooked is little more than a log when full of ova and the sport does not attract one. In the autumn however it is different. *Esocinus* is in top condition in November-December and those who have caught it then spinning or with a piece of duck's liver or a frog for a bait can tell of good fights put up and of very palatable additions to the cuisine. The long pikey head and spotted body are the most striking characteristics of the fish; it can usually be recognised by these but for more exact identification I give the following description from Day's *Fishes of India*:—

"Fin rays D 12 (4/8) P. 20, V. 10, A. 7, (2/5) C. 20.

"Length of head $4\frac{1}{4}$ to $4\frac{1}{2}$ in total length. *Eyes*. Diameter $6\frac{1}{2}$ in length of head, 2 diameters from the end of the snout and also apart. The upper jaw the longer; the maxilla reaches to nearly below the front edge of the eye. Lower labial fold interrupted in the middle. A horny covering to inside of the lower jaw. *Barbels*.—The rostral more than half longer than the eye, the maxillary a little

shorter.—*Fins*.—The dorsal as high as the body, commencing slightly nearer to the base of the caudal than to the end of the snout. The pectoral does not quite reach the ventral; the latter which arises beneath the second or third undivided dorsal ray extends two-thirds of the distance to the anal. Length of base of anal about three-sevenths ($\frac{3}{7}$ ths) of its height, when laid flat the anal reaches the caudal which is deeply forked. Free portion of the tail as high at its base as it is long. *Colour*.—Silvery with numerous black spots most distinct in the upper half of the body.

Habitat.—Leh or Ladak and headquarters of the Indus, also Kashmir and Afghanistan."

My sporting experience of the fish is limited. On a hot summer day I have watched small ones of from 5" to 10" sailing round in a clear spring-fed pool where their every movement could be watched and have played a small hackle fly on the finest of tackle over them. Presently a fish detaches itself from the shoal and comes up with a rush, a quick strike and it is either jerked out of the water away from its companions or has missed the fly altogether. In the former case a little play intervenes before the game begins again, to be continued till 4 or 5 of the little fish have been taken out. If the strike is not made at exactly the right moment, the fly is seized and dropped with such wonderful rapidity that one would be inclined to believe it had never been touched. The shoal does not appear to be in the least alarmed by the loss of its members, and it is more the absence of more flytakers than alarm that limits the catch.

Some years ago great sport might sometimes be had from house-boats in Srinagar on an autumn evening after sunset. I can well remember one or more merry parties on board a house-boat festooned with ducks from the great Holkarsar jheel. One or two rods were generally in keen hands and the excitement when a reel spoke was intense. Before dinner time 3 to 6 good fish were often got safely on board and the delight of a young girl of 13 or 14 when a grand "cheroo," which had been fighting hard on her rod for 5 minutes, was netted turning the scale at $4\frac{1}{2}$ lbs. will not easily be forgotten.

F. J. MITCHELL.

KASHMIR.

No. XLIX.—NOTE ON DISTRIBUTION OF *LETHE KANSA*,
(MOORE) AND *DOPHLA PATALA*, KOLLAR.

Lethe kansa.—Mr. de Rhé Philipe's note on this species at p. 755, Vol. XX of the Journal, is not quite accurate.

I had already recorded it as "common in Cheena, Naini Tal, at 8,000 feet and less, so at Nalena, 4,500 feet in April and May," Vol. XX, p. 134.

Its range in Sikkim too is given in Moore's Lep. Indica, Vol. I, p. 241, on the authority of Elwes as "up to 9,000 feet."

Its range in altitude and area is therefore a good deal more extended than Mr. Philipe supposes.

Dophla patala.—Mr. de Rhé Philipe's puzzle as to distribution can be readily solved by noting the distribution of its food-plant or plants. In Kumaun, to the best of my belief, it confines itself to *Quercus incana* and *Q. dilatata*. Mr. Osmaston informs me that neither of these oaks is to be found East of Nepal.

The oaks of Sikkim are:—*Q. pachyphylla*, *Q. lamellosa*, *Q. lineata*, *Q. genestrata* and *Q. spicata*, and apparently none of these suits its fastidious taste. It would be interesting to know whether the food-plant of *Dophla taonana* is an oak in Burma more nearly allied to *Q. incana* than to any of the Sikkim species, that *Dophla taonana* and *D. patala* are synonymous Mr. Philipe's note seems to leave no doubt.

F. HANNYNGTON.

CALCUTTA, 21st May 1911.

NO. L.—APPEAL FOR INFORMATION CONCERNING
PAPILIO POLYTES.

This butterfly is mentioned by Bingham (Faun. Brit. Ind. Butterflies, Vol. II, p. 61) as being dimorphic through most of its range, and trimorphic in the south of India and Ceylon. A search through entomological literature has failed to produce more than one or two precise references to the number of forms of female found in any district, though the butterfly is usually common, and must often come under the notice of Indian entomologists. Further in relation to the fact that the *polytes* and *romulus* females of the species "mimic" *Papilio aristolochiæ* and *Papilio hector* respectively, it would be of great interest to learn to what extent the mimics and models occur together. I should be exceedingly grateful for any information, however slight, on these points, and in addition I may perhaps be allowed to mention, that ova or larvæ of *P. polytes* would be very welcome, especially from a locality where only two forms of female occur. I have recently undertaken some breeding experiments in relation to the inheritance of the various forms and material from a fresh locality is exceedingly valuable.

J. C. F. FRYER.

THE ROYAL BOTANIC GARDENS,
PERADENIYE, CEYLON, July 1911.

NO. LI.—A NOTE ON *POLYOMMATUS BÆTICUS*.

De Niceville in his "Butterflies of India, Burmah and Ceylon," Vol. III., quotes no less than three distinct descriptions of the larva of *Polyommatus*

beticus and himself gives a fourth. The larva as met with in the Hyderabad district of Sind differs from all four and is as follows: Head shining black; spiracles dark brown; ground colour a dirty flesh colour or crimson with the following darker crimson markings:—a mid-dorsal line, below this on either side a series of oblique streaks, one to each segment, running backwards and outwards to meet a sub-dorsal line, a third line just below the spiracles. The whole body is covered thickly with short, stiff black bristles but on the eleventh segment, in the usual situation for the two pillar-like processes from which the tentacles are thrust forth, are two bald patches. In some specimens, I examined, these two areas were covered with a scanty covering of bristles shorter than those clothing the rest of the body and what was still more interesting, in one particular specimen, whereas one area (the right) presented immature bristles, the other was entirely bare. The pillar-like processes were absent in all specimens examined but the mouth like opening situated in the middle of the posterior part of the segment was always present. The larvæ as one might expect from this description, were unattended by ants. I attempted to persuade the larva to secrete the sweet liquid so much appreciated by ants, by means of tickling them with a camel-hair brush but no amount of irritation had any effect, and I conjecture the mouth-like organ is functionless. The larva met with in other parts of India has the pillar-like processes well-developed and is always attended by ants. Referring again to De Niceville I see in his preface to the *Lycaenidae* that he mentions that these organs were first described by M. Guenée in 1867 from a specimen of *P. beticus* and in his description of the insect observes that no less than three species attend it. The habits of the Sindh form fully explain why these organs should have degenerated, for degenerated they clearly have, the two bald areas representing the sole vestiges of the organs.

The larvæ I examined are winter forms, a period of the year when ants are more or less dormant in Sindh. The young larvæ as soon as they hatch out, eat their way into the bud on which the ovum has been deposited and then close the hole of entrance with fine web, and also prevent the bud from opening, with other strands which bind the leaves together. The larvæ are thus fairly easy to find by noticing in any panicle of bloom whether any bud has remained unopened. Examination of such a bud usually results in finding the owner at home. Thus not only are possible foes excluded but also the friendly ant, who would find it quite impossible to enter the bud in order to milk the larva. It is significant that two other larvæ, those of *Aphnaeus hypogyrus* and *Tarucus theophrastus* belonging to the same family and which are invariably attended by ants do not breed in this same district, during the winter months, probably because there are no ants in the cold season to care for them. It is to be conjectured that

P. bacticus finding the ants had forsaken it, adopted the new protective device of sealing itself in the food-buds and that later the pillar-like processes atrophied from continued disuse.

F. C. FRASER, CAPT., I.M.S.

HYDERABAD, SIND, February 1911.

NO. LII.—SOME DISPUTED POINTS IN THE ANATOMY
OF A COMMON INDIAN EARTHWORM.

In recent years it has become the custom for junior students of medicine in India to practise the dissection of various animals. It is hoped that by so doing they will foster a spirit of inquiry which perhaps lies dormant at present. It is necessary that the student should have some written guide to help him in such work, and it is essential that this guide should be accurate so far as it goes, it should not invite the student to see things which have no objective existence. I found it necessary to write such a guide for the use of my students in Calcutta. Dr. A. Powell had previously written a similar book mainly for the use of students in Bombay; this book was unknown to me until my own was in the press.

Among other animals a common species of earthworm, *Pheretima posthuma*, was chosen by us both as a type for dissection. Although I did not consult Dr. Powell's description, I received help from an earlier account of the anatomy of this species, which was written by E. Perrier. (N. Arch. Mus. Paris, Vol. VII.)

In reviewing my book for this Society's Journal, Dr. Powell points out certain discrepancies between our respective accounts of the structure of *Pheretima*, assuming, naturally enough, that my account is inaccurate. I do not, however, agree with him on the whole.

The disputed points are as follows:—

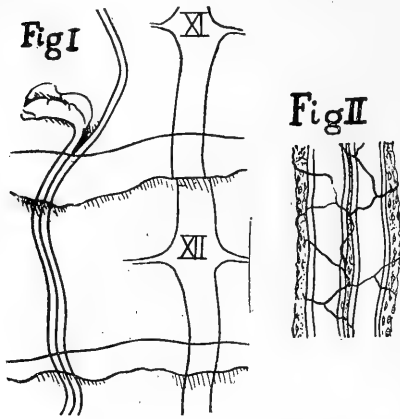
1. The distribution of the dorsal pores. Are they to be found in every segment?
2. The nature of the male generative duct. Is it a single or a double tube on either side?
3. The nature of those organs which I have called œsophageal glands. Are they excretory organs or have they some other function.

These points may be discussed in order?

In regard to the dorsal pores, Dr. Powell is quite right. I had overlooked the fact that they were not present in the first twelve segments.

In regard to the structure of the male generative ducts, I find that I am right. If one of these tubes be excised and examined under the

microscope, it will be seen to be double in its whole length. Fig. 1 shows

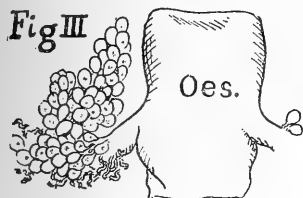


the appearance presented by an actual dissection, stained and mounted, and examined under the low power of the microscope. Fig. 2 shows a portion of the duct as it is passing through the fifteenth segment, examined under the high power. Both drawings were made with the help of the camera lucida. Dr. Powell describes this duct as single. It may be that we have been describing different species, or it may be that he has trusted too much to unaided vision.

In the above mentioned points, the basis of disagreement is clear. Dr. Powell has described certain structures as being such and such, while I have described them otherwise; but in the third matter for discussion, the nature of the glands which I have called œsophageal, we stray away from matters of fact. Since Dr. Powell has not given any description of the glands in question, I cannot compare my description with his. There are certain large glands in the fifth segment which were, I think, first described by Perrier. Dr. Powell has not mentioned their form, which is exactly like that of a bunch of grapes in miniature; nor their colour, which is red; nor their large duct, which opens into the œsophagus on either side. These structures are glands with a duct opening into the œsophagus; this is plain, hence I spoke of them as the œsophageal glands. I was unwilling to call them nephric or peptic, or even pepto-nephric, since their function is unknown. Dr. Powell will surely admit that anyone guessing the function of a glandular organ might make a mistake, unless he was guided by some evidence.

He writes in the review "we do not quite appreciate what he describes as the 'œsophageal glands.'" The verb 'to appreciate' is used in various senses; we cannot, therefore, be quite sure of Dr. Powell's opinion concerning these glands, which he does not quite appreciate. Is he of the opinion that they do not exist as described by Perrier or does he object to my agnosticism in regard to their function. It is not certain that Dr. Powell has seen the glands in question, for perhaps we have been dealing with different species, yet he is referring to my description of them when he says—"These organs are undoubtedly nephridia." The excretory organs known as nephridia in earthworms are minute whitish tubes; how then can organs which resemble red grapes be nephridia? But Dr. Powell says "undoubtedly" they are nephridia. We may, therefore, suspect that some

Zoologist of European reputation has said that they are nephridia; at the word of authority, red appears as white and avoid objects seem tubular; but how about the perplexed student, who in Bombay, no less than in Calcutta, is urged to see things as they are?



In Fig. III is shown an outline drawing of a part of an oesophageal gland. The size of the ducts in its relation to the size of the oesophagus was laid down from the object with the help of the camera lucida, it is not exaggerated. Let it be admitted at once, both by Dr. Powell and myself,

that neither of us know the nature of the substance which pours down these ducts into the oesophagus; but as the ducts are so large, we may be sure that the function is important. Dr. Powell believes presumably that the substance is some kind of excreta. But what happens to it on entering the oesophagus,—does it return to the blood in a vicious cycle, does it travel unabsorbed through the whole length of the intestine, or does the wormretch and throw it out of the mouth? Considerations such as these prevent me from teaching my students that these organs are excretory in function, quite apart from the fact that their actual function is unknown. I do not deny that nephridial tubes open into the oesophagus; for it is easy to see that many of them open into the ducts of the oesophageal glands; but I still persist in regarding the oesophageal glands as distinct, anatomically—and most probably physiologically—from the excretory organs.

Dr. Powell objects to the term used because “the name oesophageal glands has already been given to well recognised structures of totally different homology.” It is probable that by throwing together the synonymous terms calciferous glands and oesophageal pouches, which are both well known, he has come to the erroneous conclusion that the non-committal term oesophageal glands has been used for something else. I am quite unable to say whether these glands are homologous with the well known pouches of the European worm; indeed, it seems that the word homology has recently lost much of its meaning. If, as many think, we must give up our dreams of one organ gradually fading into another—for example, of a nephric organ becoming half peptic, half nephric and finally wholly peptic—so, accordingly, we must hesitate in using the word homologous.

R. E. LLOYD, CAPT., I.M.S.

CALCUTTA.

Capt. Lloyd's text-book says of the *vasa deferentia* in *Pheretima* (*Perichaeta*) *posthuma*, “the two ducts of a side come in contact in the 12th

"segment, but do not unite, they pass in close company through several "segments."

In a criticism I ventured to question the accuracy of this statement, which Capt. Lloyd now repeats, suggesting that my criticism was the result of trusting to unaided vision.

My criticism was based on observations made on six worms specially dissected for the purpose. In all six, my own vision was aided by a 1" power of the microscope; in five by laying the dissected duct longitudinally on the stage; the sixth by means of sections cut in paraffin, further examined by the 3th objective.

In all the observations my vision was corroborated by that of four graduates in Biology, two of them tutors of many years' standing. A seventh worm has since been sectioned.

In no case have I found two ducts completely separate as described and drawn above by Capt. Lloyd. In some a slight grooving or "fluting" could be seen, but in all cases the duct or ducts were firmly united in a common outer fibrous (?) coat. In one sectioned worm there was a single lumen lined by a single layer of epithelial cells. In the other there were two distinct lumina firmly bound together by a common outer coat.

This outer coat could in no way be mistaken for part of the body wall from which in most segments it stands out so freely that, unless care be taken to fix the section well to the slide, the portion of duct is likely to be washed away.

In no case could any student dissect or separate the ducts from one another.

Let me point out that there are two distinct structures attached to the œsophagus in the anterior (5th and 6th) segments of this worm:—

(a) Capt. Lloyd's bunch of grape-like glands of which he gives above an excellent drawing. I acknowledge with pleasure that my attention was first drawn to them by Capt. Lloyd himself a year or two ago in conversation.

(b) Large tufts of nephridia which require to be dissected away before (a) can be seen.

I regret that my remarks about the œsophageal glands were so loosely worded. An answer to Capt. Lloyd's query "How about the perplexed "student, who in Bombay no less than in Calcutta, is urged to see things "as they are?" will best explain what I wanted to convey.

I had supplied some thirty copies of Capt. Lloyd's book to my students.

Every one of these students when dissecting, with the aid of the book, identified the tufted nephridia as "œsophageal glands."

Capt. Lloyd's description is: "These are a pair of conspicuous glands which look like a bunch of red grapes".

Had Capt. Lloyd made any mention whatever of the much more conspicuous "tufts," there would have been no excuse for the students.

As these "tufts" are more conspicuous, larger, and have to be displaced or dissected away before Capt. Lloyd's œsophageal glands are exposed, I think the student may well object to the term "conspicuous" as used by Capt. Lloyd.

The red colour is transitory and only seen in recently killed worms.

My student's class takes place in the cold weather when the worms have been preserved in spirit for some time.

The words "these structures are undoubtedly nephridia," used by me in my critique, were not with reference to Capt. Lloyd's glands. They follow immediately and obviously refer to "what Powell has described as mop-shaped or compound nephridia."

Capt. Lloyd apparently has either not seen these structures or does not believe they are nephridia. He naively suspects that because some fancied "Zoologist of European reputation" has said they are nephridia, I blindly accept his authority!

I know of no European authority, who has described these particular glands; my sole authority is the worm itself in whom I shall trust, even if contradicted by Indian authorities.

On removing the "fluff" from the 5th segment, it is seen to be mainly composed of tubules clearly of a nephridial character. The fluffy ball in the 6th segment is clearly seen by the aid of a lens to be made up of a number of strings exactly like a miniature mop attached to a common handle.

Under the microscope and with the aid of sections, each of these strings is seen to be a tubular structure opening into the coelom by a slightly funnel-shaped aperture bearing a ciliated epithelium.

The lumen of each tube appears as it bored through the epithelial cells. These epithelial cells are continuous throughout all the tubules and their lumen opens into a common duct, the "handle" of the mop.

I repeat *these structures are undoubtedly nephridia*, and answer in all respects the definition of a nephridium morphologically.

As I have said nothing whatever about their function I fail to see the relevance of his assumption that I hold any particular beliefs as to the secretion of these organs or what becomes of it.

A. POWELL.

BOMBAY, 28th August 1911.

No. LIII.—A NATURAL BIRD-LIME.

While walking along an elephant dragging path in the north of Barateng Island in the Andamans with Sir Henry Farrington, Bart., Deputy Conser-

vator of Forests a few days ago, we were attracted by the cry of a fully fledged young White-collared Kingfisher (*Sauropatis chloris*) lying helpless on the ground and picking it up, found that its wings and feathers were hopelessly together by the glued seeds of *Pisonia excelsa*, Blume, some of which I enclose for your inspection. It will be noticed that there is a thick line of an extremely viscid fluid along each of the 5 angular sides of the nearly cylindrical seed of this species, sufficiently sticky to fasten the wing feathers of a fairly large bird together and to those of its body. It was with considerable difficulty that the seeds by which the feathers were stuck were pulled off, and this was not done without leaving a considerable amount of the sticky fluid on the feathers and pulling out many of them; had we not come to the rescue of the bird, it must have inevitably died as it could not have possibly extricated itself. The bird was not on the path when we first passed along it, and it was only on our return to camp after being in the forest for about two hours that we found the bird. It is probable that the young bird had been reared in the tree and was caught by the seeds as soon as it had fluttered out of its nest. The tree is a free flowerer, and may account for the deaths of numbers of young birds annually.

C. GILBERT ROGERS,
Conservator of Forests, Pegu Circle,
Lower Burma.

RANGOON, 13th April 1911.

[On receiving the above note, we were doubtful of the identification of the Kingfisher mentioned and wrote to Mr. Rogers, who kindly sent us a description of the bird, and from that it seems to have been a white-collared Kingfisher, *Sauropatis chloris*. As regards the seeds Dr. Willies, writing in *Flowering Plants and Ferns* under the head of "*Pisonia*" says:—"The Anthocarp is glandular and is one of the few fruits which are able to cling to feathers. Forbes states that on the Keeling Islands the fruits adhere to the feathers of herons in such quantities as sometimes absolutely to cripple them, or even to cause their death'.—Eds.]

NO. LIV.—NATURAL SELECTION.

At the risk of appearing over-captious, I would ask to be allowed space in the Journal to traverse a statement appearing on page 848, Vol. XX, No. 3, in Capt. Lloyd's note on a "*Hyæna* with deformed feet."

The sentence is as follows:—"According to the selection theory a species is not only brought into being by natural selection but after its arrival is kept constant by the same means; that is to say, it is believed that any *individuals which differ appreciably from the type of the species must die out, because they are less suited to the circumstances of life than their fellows.*"

The italics are mine and denote the words I take objection to. I do not think that they present a fair conclusion from anything advanced by

a respectable selectionist. To hold such an opinion argues a belief that the life of the world has arrived at finality and that all types are perfectly adapted to their surroundings. This no true selectionist will accept. No one affirms, as far as I know, that an individual differing from type *must die*. That would mean that the variation must necessarily be injurious and emphatically so. The individual will die if the divergence is a sufficiently harmful one. Otherwise it will fail to reproduce itself, or reproduce in diminishing ratio or simply not transmit the "acquired character," according to the degree in which the variation is prejudicial.

On the other hand, when the modification is beneficial it is likely to endure and eventually evolve a new species.

It may be pointed out here that it is too often forgotten that there are two distinct lines in variations leading to evolution: those that are noxious or beneficial to the individual and those that affect the race or community. The later case, of course, comes more into play among social and gregarious animals and many instances will occur to anyone conversant with the subject of certain traits which, though injurious to the individual, are sufficiently beneficial to the race as a whole to outweigh the detriment to the individual.

Loose expressions in regard to Natural Selection are so frequent, and these are readily seized upon by opponents to throw discredit upon it that I feel that little apology is needed for at once contradicting a misstatement or incorrect inference.

C. E. C. FISCHER, I.F.S.

COIMBATORE, 1st March 1911.

NO. LV.—IMMUNITY OF ANIMALS TO SNAKE-BITE.

In a recent article in the *Indian Field* on the subject of my heading, I was surprised to find the statement that the mongoose is completely immune to the effects of snake venom. After consulting our Journal, articles in which provided the only information to my hand, I wrote a letter on the subject to the paper in question, the substance of which I have transcribed for publication in the Journal in the hope of eliciting further information on an interesting question.

In the first place, if the mongoose be entirely immune, why should he occasionally show fear of a cobra, and always, as I believe to be the case, display great activity in avoiding a bite?

The *Indian Field* article does not give the name of the French writer by whom the complete immunity of the mongoose is said to have been proved. Professor Calmette, not the least eminent French authority on snake poisons, arrived at a different conclusion. He found that eight times

the dose of venom sufficient to kill a rabbit proved fatal to a mongoose in twelve hours; and, as the result of his experiments, concludes:—"The mongoose is able to bear without discomfort very considerable doses relative to its size, but its immunity is not absolute. If it generally triumphs in its struggles with venomous snakes, it is chiefly due to the extreme agility with which it is endowed." It is not quite clear whether these experiments were made with the poison of the cobra or with that of the West Indian "fer-de-lance" (*Lachesis lanceolatus*): apparently the latter.

Again Fleet-Surgeon G. W. Bassett-Smith writing in the "Encyclopædia Medica" in 1902 remarks:—"The mongoose is remarkably resistant to cobra poison, requiring from 10 to 25 times as much venom per kilo. as a rabbit, to produce lethal effects."

It is obvious then that a mongoose's chance of life, once he is bitten while greater than a rabbit's, yet depends on the quantity of venom injected, being less than a fatal dose for him. It may be of interest to consider whether the amount of poison injected by a bite from an average cobra under normal conditions would be more or less than enough for a mongoose.

Now the minimum lethal dose of cobra poison for a rabbit is, according to the late Major Lamb, I.M.S., .035 millegrammes per kilogramme of the animal's weight. Taking the highest estimate of the dose for a mongoose, 25 times the above is 8.75 millegrammes per kilo. If a mongoose weighs 2 kilos, which, I doubt, it follows that 20 millegrammes would be more than a fatal dose. Now a medium-sized cobra will (again according to Lamb) yield about 200 millegrammes of venom, while the fatal dose for an average man is calculated at about 50 millegrammes. We have too good reason to know that the latter dose and more is frequently injected, and it is probable that a healthy cobra can, on occasion, inject the whole content of its poison gland at a single effort. It is, therefore, beyond question that the danger, to a mongoose attacking a cobra, of receiving a fatal bite, if fairly struck, is considerable.

It appears then that the undoubted anti-toxic qualities existing in the blood of the mongoose are not of themselves sufficient to secure more than a very partial immunity.

Bassett-Smith writes:—"Elliott believes that the success of this animal in fighting cobras depends on (1) its great agility, (2) its habit of setting up its fur, thus deluding the snake as to its vulnerable part. Its immunity is due to the habit it has of seizing the snake by the head, and often by so doing, incising the poison-gland with its sharp teeth, causing the venom to escape and be swallowed by the mongoose; this would also reduce the possible amount to be injected down the fang. Then there is the inoculation of minute quantities of venom from repeated but ineffectual scratch

bites. In these ways a partial immunity, which is hereditary, is established, becoming lost in time if the animals be removed to countries where cobras do not exist."

This theory is a plausible one. But there is a stumbling-block. It is not difficult to imagine a mongoose, by reason of his agility and increasing experience, surviving a number of encounters at the cost of a few scratches which the antidote in his blood has prevented from having fatal effects. These successive inoculations together with the poison swallowed at times would tend to increase his immunity, so that an elderly individual might take a good deal more killing than a comparative youngster.

But can this additional immunity acquired from inoculation be transmitted to the animal's offspring? It is the old question of the heritability of accidentally acquired characters, often affirmed but never proved. Possibly the mongoose may eventually afford the evidence that has hitherto been sought in vain. (I offer this suggestion gratis to any advocates of the theory who may be on the look-out for new lines of investigation. It should be simple enough. Start a mongoose stud and inoculate each generation up to the limit: in course of time, if your breed be a good one you should be in a position to supply all the laboratories in the country with anti-venine!)

It may be that the fact of the immunising factor being an anti-toxin in the blood places it in a different category to other acquired characters, as it would seem possible for the embryo to be inoculated before birth from the anti-toxic element in its mother's blood. If so, it is sure to be a well-known fact, and I have, in the valour of my ignorance, been merely tilting wind mills. I must take my chance of that!

If this is not the case, however, and we decline in the absence of satisfactory proof to believe that acquired characters can be inherited, it follows that we are in entire ignorance as to how the mongoose's existing inherited partial immunity originated, though it has doubtless been strengthened in some measure by centuries of natural selection. From this the further conclusion may be drawn that this inherited immunity probably almost certainly differs in its nature from such additional immunity as the individual animal may acquire from inoculations during its life-time.

This conclusion is found to be of value when considered in relation to an important fact, which I have not yet mentioned: I mean the fact of the highly specific character of snake venoms which appear to have been established beyond question by the most recent investigations, alike in India, Australia and America, the consequence of which is that an anti-toxin obtained from the poison of the cobra, for instance, is absolutely ineffective as a curative against the poison of krait or daboia—Calmette's original belief to the contrary notwithstanding.

Hence it is to be deduced that any immunity which the Indian mongoose

may acquire from inoculation with the venoms of Indian snakes will afford it no protection against the bites of distinct species from other parts of the world. But it *may* be the case that the *inherited* immunity of whose origin we are ignorant, does possess a more general protective power.

I am under the impression, which may be mistaken, that the venom of *Lachesis lanceolatus* is relatively less deadly than that of the Indian cobra. If so, it is of interest in this connection to note that Professor Calmette's experiments appear to indicate a lessened degree of immunity in respect of the former species.

As to whether, or how far, the Indian mongoose is, in point of fact, protected against venomous snakes other than Indian, I have no knowledge. He may be quite unaffected by a dose of 10 to 15 millegrammes of cobra poison or of 3 or 4 millegrammes of the krait's deadlier prescription, but personally I should hesitate to back his chances against a proportionate injection of the venom of, say, the Australian Tiger-snake or the rattle-snake.

If, however, the inherited immunity of the mongoose is found to be at all general, as the article in the *Indian Field* implies, the theory is at once shown to be impossible, that such immunity was originally due to the effects of inoculation through successive generations with the venoms of such snakes only as inhabit the same countries as itself. Unless, indeed, the father of all serpents inoculated the father of all the mongoose tribe with a venom containing all the characteristics of all the various specialised snake venoms now in existence!

If I have ventured to write rather a long screed on a subject I know nothing about, it is in the hope of inducing one or two of those who do know to put pen to paper for the benefit of myself and other dwellers in ignorance. Can any Members give evidence as to a suggested immunity to snake-bite on the part of the *Felidæ*?

I should mention that the quotations I have made from Calmette and Bassett-Smith are taken from the Society's Journal, Vol. XI, p. 516, and Vol. XV, p. 115. Major Lamb's figures are from articles in Vol. XIV, p. 221, and Vol. XVII, p. 16.

Since writing the above, I have come across a reference which, with regard to the *Felidæ*, may be worthy of note. Major Wall in Vol. XVII of the Journal, p. 383, quotes Mervyn Smith as stating that "the tiger slayers in Chota Nagpur poison their arrows with cobra-poison and set them in traps to be sprung. When wounded, the Tigers go off and soon die, their movements being watched by the hunters."

A. H. MOSSE, CAPTAIN, I.A.

DWARKA, 5th May 1911.

No. LVI.—NATURAL HISTORY NOTES FROM THE RED SEA.

The following notes made on the voyage out on the P. & O. S.S. "Caledonia" may interest members:—

Birds.

Grey Wagtail..19th Mar. 1911 ..23°14 N. 32°E... 473 miles from Port Said.

3 Quail ..20th Mar. 1911 ..18°53 N. 39°33E. Flying from W. to E. singly at 8 A.M. against a strong N. E. wind.

3 Hoopoes ..20th Mar. 1911 ..12°34 N. 46°39E. At 9 A. M. near "Twelve Apostles" flying from W. to E.

Insects.

Catapsilia crocale, 20th Mar. 1911, 17°0 N., 40°E. About 50 miles from land. This butterfly fluttered round the ship at dusk and eventually was blown away by the N. E. wind blowing at the time. The same morning noticed a small noctuid moth which also disappeared overboard, but I failed to identify it.

F. HANNYNGTON, I.C.S.

CALCUTTA, 14th April 1911.

PROCEEDINGS.

MEETING IN BOMBAY.

A meeting of the members of the Bombay Natural History Society took place on Tuesday, 8th August 1911, at the Society's Rooms, Mr. John Wallace, C.E., presiding. The election of the following 54 new members since the last meeting was duly announced:—New Members.—Lt. H. F. E. Childers, Burma; Mr. F. A. Heron, Punjab; Mr. G. M. Carson, New Guinea; Lt. F. R. Cosens, Colombo; Mr. L. Aubert, B.A., B.Sc., F.R.G.S., Burma; Mr. G. R. Higginson, Lucknow; Messrs. John Bale Sons, and Danielsson, Ltd., London; Mr. Jehangir D. Vakil, Bhavnagar; Mr. E. D. Chanter, Rangoon; Mr. H. H. L. Prendergast, Arkonam; Mr. J. Pemberton Cook, Burma; Mr. R. C. C. Campbell, Burma; Mr. Motilal Vallabhji Bombay; Mr. H. E. Cross, Naini Tal; the Mess Secretary, R. A. Mess, Roorkee; Mr. F. A. Clift, Burma; Mr. J. C. D. Raper, A.M.I.C.E., V.D., Lanowli; Mr. M. Machaya, Bangalore; Capt. H. G. Andrews, Bombay; Mr. H. V. O. Donel, Alipur, Duars; Mr. N. Marryatt, Abu Road; Mr. G. E. R. Slade, Sabarmati; Major N. W. Haig, Mhow; Capt. F. B. Nixon, Mhow; Dr. T. H. Bishop, Kaksey, E. Bengal; Mr. V. A. Julius, Colombo; Mr. S. G. Butler, Assam; Mr. R. S. Croup, I.F.S., Dehra Dun; Mr. Thrusten Hamer, Ceylon; Mr. S. R. S. Congreve, Coimbatore; Mr. M. S. Merrikin, Maubin; Mrs. J. L. Panday, Bombay; Mr. G. Mackrell, Sylhet; Mr. H. Hampton, Rangoon; Capt. J. W. Pickthall, Rangoon; Mr. F. Clayton, Nagpur; Mr. J. Aird, Nilgiris; Mr. A. P. Warburton, Kindat; Mr. S. W. Kemp, Calcutta; Mr. F. H. Gravely, Calcutta; Mr. L. B. Firth, Calicut; Mr. G. S. Shirley, Rangoon; Mr. N. G. Webb, Duars; Mr. J. L. Durant, Duars; Mr. C. R. Peters, Benares; Mrs. C. T. Wheeler Cufte, Rangoon; Mr. D. W. Rae, Kachin Hills; Lt. G. S. Smart, R.A., Burma; Major A. Scott, Pachmarhi; Lt. R. W. Hingston, I. M. S., Bombay; Mr. P. B. Joly, China; the Mess President, 42nd Deoli Regiment, Deoli, Rajputana: Lt. S. Murray, Satara; and Lt. R. Wallace, Satara.

CONTRIBUTION TO THE MUSEUM.

The Joint Honorary Secretary, Mr. N. B. Kinnear, acknowledged the following contributions to the Museum since the last meeting:—

Contributor.	Locality.	Donor.
A number of bats	Ratnagiri . .	Mr. G. S. Hardy, I.C.S.
2 Thar, <i>Hemitragus jemlaicus</i> , skins and skulls. 1 Musk deer <i>Moschus moschiferus</i> , skin and skull. 1 Himalayan Black Bear, <i>Ursus torquatus</i> , skin and skull.	Garhwal . .	„ J. C. Pickersgill Cunliffe.

Contributor.	Locality.	Donor.
Hog deer, <i>Cervus porcinus</i> ..	Sind ..	H. H. the Rao of Cutch.
Oorial, <i>Ovis vignei</i> , skin and skull..	S. Persia ..	Mr. G. B. Scott.
Young Markhor, <i>Capra falconeri</i> , skin and skull.	Chitral ..	Capt. R. A. Lyall.
Flying squirrel <i>Petaurista cindarella</i> .	Satpuras ..	Mr. A. H. A. Simcox, I.C.S.
Flying squirrel, <i>Petaurista cindarella</i> .	Khandwa ..	„ J. K. Morton.
Flying squirrel, <i>Sci. ropterus sp.</i> ..	Siam ..	„ J. Keddie.
Small Indian Civet, <i>Viverricula malaccensis</i> .	Saugor ..	„ D. O. Witt.
Leopard Cat, <i>Felis bengalensis</i> ..	Meerpoore, Bengal. ..	„ J. E. Walker.
Toddy Cat, <i>Paradoxurus niger</i> and Jackal, <i>Canis aureus</i> .	Dibrugarh ..	Major W. White.
Tickell's Staphida, <i>Staphida striata</i> .	Karin Hills ..	Hon'ble S. Robertson.
European Bustard, <i>Otis tarda</i> ..	Chitral ..	Lieut. Stirling.
Eggs of Small White-throated Babler, <i>Dumetia albigularis</i> .	Horselykonda ..	Mr. P. R. Allen.
Tern, <i>Sterna media</i>	Bombay Harbour. ..	„ S. H. Prater.
John's Earth snake, <i>Eryx johni</i> (alive).	Khandesh ..	„ A. H. A. Simcox, I.C.S.
Russell's Earth snake, <i>Eryx conicus</i> (alive).	Santa Cruz ..	Major C. H. Ward.
<i>Zamenis diadema</i> and Russell's Earth snake, <i>Eryx conicus</i> (alive)	Jodhpur ..	Mr. H. N. Ward.
Cobra, <i>Nia tripudians</i>	Shekh-Buddin..	Capt. A. H. Napier.
Cobra „ „	Bombay ..	From the collection of the late Dr. B. Desai through V. N. Gorackshaka.
Skink, <i>Mabuia carinata</i> with deformed tail.	Bombay ..	Mr. C. C. Stileman.
2 Flying Lizards, <i>Draco</i>	Siam ..	„ J. Keddie.
A number of lizards	Almora ..	Major F. Wall, I.M.S.
Several Fish	Mazagon ..	Mr. V. H. Gutleridge.
A number of Butterflies	Simla ..	Capt. Thornhill.
50 Eggs of the Mugger or Broad snouted crocodile, <i>Crocodilus palustris</i> .	Vihar ..	Mr. P. R. Cadell, I.C.S.
Some Centipeds	In exchange ..	Indian Museum.

Minor contributions from Miss P. Threlfell, Messrs. H. E. Standage and T. Croft, R. W. Harter, S. H. Prater, P. Gomes, W. Walsh, C. E. C. Dawkins, N. Kerr, H. Navalkar and Capt. W. Cullen.

INDIAN MAMMAL SURVEY.

The Secretary announced that since the last meeting of the Society, Rs. 9,000 had been received, making a total of Rs. 19,000 up to date. Amongst the principal contributors were H. R. H. the Duke of Connaught, H. H. the Nizam, Mr. Ratan J. Tata, H. H. the Gaekwad of Baroda (2nd donation), and Lord Reay. He read a letter which had been received from H. E. the Viceroy expressing his approval and interest in the scheme. He said, now that the total sum had reached Rs. 19,000 it was proposed to bring out a second collector and Mr. Millard, who was at home was endeavouring to secure the services of Mr. G. C. Shortridge (late of the British Ornithologists expedition to New Guinea). If Mr. Shortridge's services were secured he would arrive out here in the beginning of October, and starting at Dharwar, would work South India and the East Coast. Since the last meeting two more consignments of skins had been received from Mr. Crump, one from Khandesh and one from the Berars containing some interesting specimens. Whilst in the Berars Mr. Crump received great help from all the officials, and the thanks of the Society were due to them for their kindness and the interest they had taken in the scheme.

For the last month Mr. Crump had been in Cutch, where he was making large collections, and a consignment of skins was expected shortly. The Cutch collections would be extremely valuable as there were a number of species peculiar to Cutch, and it would be interesting to see how the fauna compares with that of Sind and Kathiawar.

H. H. the Rao of Cutch, who has taken a great interest in the survey, had been assisting Mr. Crump in every way. All the specimens collected in Khandesh had been sent home and were now being worked out by Mr. R. C. Wroughton at the British Museum from whom a report was shortly expected.

Mr. S. P. Agharkar exhibited and made some remarks on a specimen of a fresh-water medusa (*Limnocoñida*) found by him in the pools of the Koyna and Yemna rivers.

The following paper on "White Ants and their ways," was then read by Revd. J. Asmuth, S.J.

CONTENTS OF THIS NUMBER—(contd.).

	PAGE.
A NEW SNAKE FROM THE WESTERN HIMALAYAS <i>Trachischium quinquelabialis</i> . By Major F. Wall, I.M.S., C.M.Z.S.	201
PLANTS OF THE PUNJAB. A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR. Part IX. By Colonel C. J. Bamber, F.L.S.	203
PROGRESS OF THE MAMMAL SURVEY	229
MISCELLANEOUS NOTES :—	
No. I. Tiger calling like a Sambur. By Major H. H. Harington, and J. W. Best, I.F.S.	235
II. Young Tiger attacking human beings. By H. E. Cross.	236
III. Panther and Wild Boar. By Lt. F. Fitz-Gibbon....	237
IV. Golden Cat, <i>Felis temmincki</i> , killing Buffalo Calf. By N. B. Kinnear.	238
V. Mungooses in the Eastern Ghats. By P. Roscoe Allan	238
VI. Distribution of the Sloth-Bear (<i>Melursus ursinus</i>), and the Indian Lion (<i>Felis leo</i>). By R. Khengarji	238
VII. The Birth of the Wild Elephant Calf. By C. W. Allen, D.F.O.	239
VIII. Notes on the Gaur (<i>Bos gaurus</i>). By Aylmer F. Martin	241
IX. The Domestic Breeds of Indian Sheep. By H. J. Elwes, F.R.S.	245
X. Weight and Measurements of a Serow. By A. M. Primrose	246
XI. Weight and Measurement of a Goral. By A. M. Primrose	247
XII. Strange mortality amongst Black Buck (<i>Antelope cervicapra</i>). By Lt.-Col. G. H. Evans, I.C.V.D.	247
XIII. Large heads of Malay Sambar and Brow Antlered Deer. By H. J. Davis, F.G.S.	248
XIV. Crow and its Food. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	248
XV. Notes relating to the habits and nidification of the Black-Headed Sibia, <i>Lioptila capistrata</i> (Vigors). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	249
XVI. A New Bar-Wing from Burma.	256
XVII. Curious behaviour of a Myna. By Lt. F. B. Scott ..	257

CONTENTS OF THIS NUMBER—(contd.).

	PAGE.
MISCELLANEOUS NOTES—contd.	
XVIII. Notes on Birds round Rawalpindi. By H. Whistler.	257
XIX. Notes on the nidification of <i>Microcichla scouleri</i> (Vigors), The Little Forktail. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	257
XX. Nesting Notes from Lower Burma. By S. M. Robinson.	261
XXI. Some Winter Visitors to Rawalpindi. By H. Whistler.	261
XXII. Seasonal movements of the Himalayan Greenfinch (<i>Hypocanthus spinoides</i>). By Capt. R. B. Skinner, R.E.	261
XXIII. Occurrence of <i>Hemilophus pulverulentus</i> (Temm), the Great Slaty Woodpecker, in the neighbourhood of Simla, N.-W. Himalayas. By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	263
XXIV. Hornbill devouring young Paroquets. By Lt.-Col. A. Newnham, I.A.	264
XXV. Jack Snipe in the Cawnpore District. By Capt. W. B. Spalding, R.A.	264
XXVI. Nesting of the Cinerous vulture (<i>Vultur monachus</i>) near Quetta. By Major T. E. Marshall, R.E.	264
XXVII. Uncommon Birds in Burma. By J. P. Cook.	265
XXVIII. Falcon and Gulls. By Lt.-Col. S. E. Prall, I.M.S.	267
XXIX. Nesting of the Osprey or Sea-Hawk. By Lt.-Col. S. E. Prall, I.M.S.	268
XXX. European Great Bustard in Chitral. By N. B. Kinnear.	268
XXXI. Woodcock in Kulu. By J. Coldstream, I.C.S.	268
XXXII. Occurrence of Swinhoe's Snipe (<i>Gallinago megala</i>) at Myitkyina, Upper Burma. By Capt. F. E. W. Venning	269
XXXIII. Occurrence of the Pantail Snipe (<i>Gallinago caelestis</i>) in Siam. By D. O. Witt, I.F.S., and W. J. F. Williamson	269
XXXIV. Snipe Shooting in Upper Burma. By E. N. Bell.	272
XXXV. The Occurrence of a "Booby" <i>Sula cyanops</i> at Cannanore. By Major H. R. Baker	272
XXXVI. The Occurrence of <i>Cygnus bewicki</i> and other Swans in India. By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.	273
XXXVII. Uncommon Birds in the United Provinces. By Capt. M. A. Gudlestone, 41st Dogras	274

1076

CONTENTS OF THIS NUMBER—(concl'd.)

	PAGE.
MISCELLANEOUS NOTES— <i>contd.</i>	
XXXVIII. Nidification of the little Grebe or Dabchick (<i>Podiceps albipennis</i>). By John Fry.	275
XXXIX. Recovery of Birds from injuries. By Lt.-Col. G. H. Evans, I.C.V.D.	276
XL. Habits of the Python (<i>Python molurus</i>). By W. Forsyth	277
XLI. Remarks on two rare blind snakes. By Major F. Wall, I.M.S., C.M.Z.S.	278
XLII. On the occurrence of the snake <i>Dipsadomorphus nuchalis</i> (Beddome) in Berhampur, Orissa. By Major F. Wall, I.M.S., C.M.Z.S.	279
XLIII. Is <i>Lycodon gammiei</i> (Blanford) an aberrant specimen of <i>Lycodon fasciatus</i> (Anderson)? By Major F. Wall, I.M.S., C.M.Z.S.	279
XLIV. Do Snakes swallow stones? By E.A. D'Abreu, F.Z.S.	281
XLV. Remarks on the Greater and Lesser Black Kraits (<i>Bungarus niger</i> and <i>B. lividus</i>). By Major F. Wall, I.M.S., C.M.Z.S.	281
XLVI. Large Common and Banded Krait. By Major O. A. Smith.	283
XLVII. The Development of Embryo in the eggs of the oviparous viper <i>Lachesis monticola</i> prior to oviposition. By Major F. Wall, I.M.S., C.M.Z.S.	284
XLVIII. A sporting Kashmir Fish, the Cheroo, <i>Schizothorax esocinus</i> . By F. J. Mitchell	285
XLIX. Note on the distribution of <i>Lethe kansa</i> (Moore) and <i>Dophla patala</i> , Kollar. By F. Hannington, I.C.S..	286
L. Appeal for information concerning <i>Papilio polytes</i> . By J. C. Fryer	287
LI. Note on <i>Polyommatus beticus</i> . By Capt. F. C. Fraser, I.M.S.	287
LII. Some Disputed points in the Anatomy of a common earth worm by Capt. R. E. Lloyed, I.M.S., and A. Powell	289
LIII. A Natural Bird-Lime. By C. Gilbert Rogers	293
LIV. Natural Selection. By C. E. C. Fischer, I.F.S.	294
LV. Immunity of Animals to Snake bite. By Capt. A. H. E. Mosse, I.A.	295
LVI. Natural History Notes from the Red Sea. By F. Hannington, I.C.S.	299
PROCEEDINGS.....	300

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W. S. MILLARD,
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CONTENTS OF THIS NUMBER.

	PAGE
THE GAME BIRDS OF INDIA, BURMA AND CEYLON. Part V. The Great Indian Bustard (<i>Eupodotis edwardsi</i>) and Macqueen's Bustard (<i>Houbara macqueenii</i>). (With Plates V and VI). By E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.	303
SOME NEW INDIAN RODENTS. By R. C. Wroughton, F.Z.S. (With a Plate)	338
THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED. Part VI. (With Plates XXVI—XXXII, and text figures 20—23). By E. Blatter, S.J.	343
THE BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SUR- VEY OF INDIA. REPORT BY R. C. WROUGHTON, F.Z.S., ON COLLECTION NO. 1, FROM EAST KHANDESH	392
THE MOTHS OF INDIA. Series IV, Part III. By Sir George F. Hampson, Bart, F.Z.S., F.E.S.	411
A POPULAR TREATISE ON THE COMMON INDIAN SNAKES. Part XVII. The Indian Python (<i>Python molurus</i>). (With Plate XVII.) By Major F. Wall, I.M.S., C.M.Z.S.	447
A MONOGRAPH OF THE WASPS OF THE GENUS <i>OERCERIS</i> INHABITING BRITISH INDIA. Part I. (With Plates A and B). By Rowland E. Turner, F.Z.S., F.E.S.	476
THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA. Part X. (With Plates D2, D3 and D4). By T. R. Bell, I.F.S.	517
BIRD NOTES BY THE WAY IN KASHMIR. By Major H. A. F. Magrath	545
A LIST OF INDIAN BUTTERFLIES. By Capt. W. H. Evans, R.E.	553
SOME MAYMYO BIRDS. Part II. By Major H. H. Harington	585
NOTES ON BUTTERFLIES FROM THE NAGA HILLS. Part II. (With Plate B.) By Major H. C. Tytler	588
NOTES ON FLATA. (With Plates A and B). By J. C. Kershaw, F.Z.S., F.E.S.	607
THE OOTHECA OF AN ASILID. (With Plates A and B). By J. C. Kershaw, F.Z.S., F.E.S.	610
RAMBLING NOTES ON NATURAL HISTORY IN CHITRAL. By Major F. Wall, I.M.S., C.M.Z.S.	614



♂ THE GREAT INDIAN BUSTARD (*Eupodotis edwardsi*).

♀

SECOND INTERNATIONAL CONGRESS OF ENTOMOLOGY.

The Second International Congress of Entomology will be held at Oxford from August 5th to 10th, 1912. Further particulars will be announced shortly.

The Executive Committee proposes to find for Members of the Congress lodgings in the town, or rooms in one or more of the Colleges at a moderate charge; rooms in College will be available only for men.

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MARCH 1912.

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No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VI.

(Continued from page 47 of this Volume.)

ERRATA.

In Vol. XXI, No. 1, page 43, two paragraphs containing a note by Mr. M. M. Currie on the Houbara have by mistake found a place in my article on *Otis tetrao*, The Little Bustard. These two paragraphs have now been inserted in their proper place in the article on *Houbara macqueenii* and should be considered as deleted from that in the former number.

In the key to the genera of Otididæ, p. 21, after—

“b¹ wing under 16" ...Sypheotis” there should be ♂

After—

“a² wing more than $\frac{1}{3}$ length of wing ...Sypheotis”, there should be ♀.

Genus—*EUPODOTIS*.

This genus, which contains but one species occurring within our limits, the largest of our Indian Bustards, can be distinguished at

a glance from any other by its large size, combined with its black-crested crown. The sexes are alike in plumage but the male very greatly exceeds the female in size. The genus *Eupodotis* contains altogether four species, two African, one Indian, and one, which, as I have already said, is very closely allied to the latter, Australian.

EUPODOTIS EDWARDSI.

The Great Indian Bustard.

Otis edwardsii.—Gray, in Hardw. Ill. In. Zool. 1. (1830); Hume, Str. Feath. 1, p. 227; Adam, *ibid*, p. 393; *id*, *ibid*, ii, p. 339.

Eupodotis edwardsii.—Blyth, Cat. B. Mus. As. Soc., p. 258.

Eupodotis edwardsi.—Jerdon, B. of I. iii, p. 607; Stoliczka, J. A. S. Bengal, xli, p. 250; Hume, Nest & Eggs, I. B., p. 557; *id*, Str. Feath. i, pp. 125, 237; Butler, *ibid*, iv, p. 9; Ball, *ibid*, p. 234; Fairbanks, *ibid*, pp. 262, 266; Hume & Marsh, Game B. of I. i, p. 7; Davids & Wend, Str. Feath. vii, p. 87; Ball, *ibid*, p. 266; Tweedie, *ibid*, p. 528; Hume, *ibid*, viii, p. 111; Wilson, *ibid*, p. 490; Butler, Cat. B. Sind, etc., p. 56; *id*, Cat. B. of South Bom. Pres., p. 71; Davidson, Str. Feath. x, p. 318; Murray, Vert. F. of Sind, p. 217; Barnes, B. of Bombay, p. 320; Oates in Humes N. & E, 2nd Edit. iii, p. 375; Blyth, B. of India, iv, p. 194; Sharpe, B. M. Cat. xxiii, p. 325, *id*, Hand. List i, p. 176; Oates, Cat. Eggs B. M., ii, p. 90; Oates, Game-Birds i, p. 399; Barnes, Bom. Nat. His. Journal, i, p. 57; Rayment, *ibid*, ix, p. 107.

Vernacular names.—Ghorar, *Kathiawar*; Tugdar, *Punjab*; Gurayin, *Haryana*; Sohun, *Gughumbher*; Hukna, *H.*; Serailu, *H.* (Nerbudda); Bherar, *Saugor*; Hum, *Mahr.*; Mardonk, Maldhonk, Karadhonk, Karlunk, *Deccan*; Tokdar of *Mahomedan Falconers*; Gurahna, *Sind*; Bat-Meka, Bat-myaka, *Tel.*; Batta-mekha, *Yanadi*; Gunad, *Pardi*; Kanal-Myle, *Tam.*; Heri-hukki, Arl-kujina-hukki, *Yereladdu Can.*

Description, Adult male.—Crown from bill to nape black with a certain amount of white stippling near the forehead and with the nape mixed black and white, remainder of head and neck white, pure in very old birds but faintly barred with brown or brownish black, more especially on the upper neck, in young birds. Back,

rump and upper tail-coverts, together with scapulars, inner secondaries and lesser wing-coverts deep buff, finely vermiculated with black; the median wing-coverts are dark greyish or brownish black generally tipped with white, greater coverts deep grey, edged black and tipped white; primaries dark brown becoming more grey on the innermost; outer secondaries dark grey, these and the primaries all tipped with white and the inner ones marked with a white band on the inner web. Underwing coverts white; flanks dark grey; tail like the back but more grey and with a broad terminal band of blackish brown, with the outermost one or two pairs of rectrices tipped white. A broad black band across the breast often continuing right round to the hind neck where it divides the white of the neck from the buff of the back. Undertail coverts and feathers round vent blackish brown, marked with white and with white tips; thighs generally much marked with black and sometimes entirely black; rest of underparts white.

"The legs and toes are generally yellowish creamy, a little dingy on the toes; but I have noticed specimens in which the legs had more of a light fleshy tinge and others in which the pale yellow had a grey or plumbeous tinge; the irides vary from pale to light yellow; the bill is greyish brown to greyish white, dusky at tip and near forehead, and often a little yellowish below." (Hume.)

"Length 45 to 50 inches; expanse 86 to 96; wings 24.5 to 29; tarsi 7.5 to 8.37; bill to gape 4.0 to 4.75; weight 17 to 22 lbs." (Hume).

The middle toe averages about 2.95" in length.

Jerdon gives the weight as up to 28 lbs., but this weight is unusual. The heaviest I have received any record of is one shot by Major A. B. Burton of $26\frac{1}{2}$ lbs. and Col. L. L. Fenton gives the average weight of cocks as 21 lbs.

Blanford in "Avifauna of British India" gives the weights of hens as 10 lbs. and of cocks as 25 lbs. to 35 lbs. and says that birds of 40 lbs. have been recorded. I cannot trace these records and there may possibly be some mistakes about them.

The crest feathers are about 2" in length.

Adult female.—The adult female only differs from the male in being very much smaller, in having the white of the head and neck less pure and more vermiculated with black bars and in having the pectoral band absent or only faintly indicated except at the sides. Length of wing 18" to 22"; tail 9" to 10"; tarsus 6.20" to 6.50"; middle toe about 2.5"; bills, culmen 2.20" to 2.35"; from gape 3.00" to 3.20".

Weight from 8 to 11 lbs., running up to 13 lbs., but sometimes heavier still, as Capt. J. R. J. Tyrell informs me that in December 1905 he shot a female weighing between 14 and 15 lbs. not far from Dhar in the Bhopawar Agency, C. I., whilst Major Burton records three hens between 17 to 18 lbs.

The crest feathers are not often as fully developed as in the male.

Young male.—Resembles the female but with buff spots on the crown, hind neck and upper back.

Nestling.—Covered with down, buff above with black marks on the head and upper back; below white or buffy white.

The distribution of the Great Indian Bustard, which is not, of course, found outside Indian limits, is thus given by Blanford in the fourth volume of the "Avifauna of British India." The Plains of the Punjab between the Indus and the Jumna, also Eastern Sind, Cutch, Kattyawar, Rajputana, Guzerat, the Bombay Deccan, the greater part of the Central Provinces, extending as far East as Sambalpur, the Hyderabad territories, and parts of the Madras Presidency and the Mysore State as far South as Southern Mysore and perhaps further South. Stragglers may be found outside the area specified, as in Western Sind, Meerut and Oudh; but the Bustard is unknown in Behar, Chota Nagpur, Orissa and Bengal, on the Malabar Coast and in Ceylon."

Oates, in his "Game Birds" thus briefly describes its habitat: "It is found in the Punjab and less commonly in Sind. To the East it ranges as far as the Jumna and approximately up to a line, roughly speaking, connecting Delhi and Sambalpur in the Central Provinces. Southwards it is met with down to about the 11th degree of North latitude."

Capt. K. L. W. Mackenzie, of the 62nd Punjabis, writes to me that he shot "one of a party of four hen Great Indian Bustard at

a place called Meja in the Allahabad District, about half way between Allahabad and Mirzapur. This is considerably further East than the limits laid down by Oates."

In "Stray Feathers," Vol. IV., Mr. F. Wilson records the fact that a few Great Bustard are always to be found in Mazuffernugger during the cold weather, he, himself, having on one occasion seen a flock of sixteen. Mr. F. W. Butler in the same volume confirms this and says that a few are to be found in the district throughout the year. He also states that "between line of railway and the Ganges Canal, from near Roorkee to, I believe, Ghaziabad there runs a broken range of sandhills. Along the tract right and left of the range the land is high and sandy and here Bustards are to be found. I cannot positively assert that they extend into the Meerut District; but I believe such is the case; and certainly a bird is occasionally to be seen during the rains in the Saharanpur District, East of Deoband."

"In 1871 I was in the Mirzapur District. I was told by natives, and also, I think, by Mr. Pollock, C.S., that both Bustard and Florican were to be found some miles from the station, along the Great Deccan Road."

I have several letters informing me that this fine Bustard is common in parts of Eastern Sind, and by no means rare in one or two favoured localities in Western Sind. In respect to Kathiawar Col. L. L. Fenton writes "It is found throughout the Province of Kathiawar in suitable localities, which means everywhere except the Gir Forest and the Barda Hills" and he adds, "Malia on the Gulf of Cutch as well as Chotila on the old Rajkot-Wadhwan road are also good localities for them in the cold weather."

Very numerous letters from observers and sportsmen who have been good enough to report to me the result of their experiences, in some instances dating from the publication of Hume and Marshall's "Game Birds," add nothing further to the area as given by Oates and Blanford. At the same time these letters are of extreme interest as showing that the Great Indian Bustard is in many parts of India most irregular in its movements and that in other parts it is merely a seasonal visitor, either for the purpose of breeding or during the non-breeding season.

Writing of thirty years ago Col. L. L. Fenton noticed this semi-migratory habit and speaks of their being especially plentiful in the neighbourhood of the Rajkot-Wadhwan Road to the N.-W. of the Province in the cold weather and increasing greatly in numbers about Rajkot itself during the rains. Hume deals with this matter very briefly and merely says "It is to a great extent migratory, spending one season of the year in one part of the country, and moving to another to breed. Thus, for instance, in what used to be called Bhattiana, now the Sind District it is extremely abundant during the rainy season, when it breeds; whereas, during the cold season, it is comparatively scarce. Further on (p. 12) Hume quotes Davidson to the following effect "In Poona and Sholapur it is certainly a permanent resident, that is to say, that at all seasons a few may be found in all parts of the Collectorate. I think, however, that more breed in the district than are to be found there in February or March, and that birds come in, in the beginning of rains, to breed and leave when their young are able to fly."

The Great Indian Bustard usually associates in small flocks. In the cold weather two or three cocks or two or three hens may be seen keeping one another company, but in the breeding season the parties consist as a rule of an old cock bird with his harem of two to six or more wives. Sometimes, however, they collect in large droves. Jerdon says "I have seen flocks of twenty-five or more, and a writer in the *Sporting Review* mentions having seen above thirty on one small hill." Mr. E. James also records that on one occasion he counted more than thirty birds in a flock and Mr. S. Doig found no less than 34 birds feeding together in one *Jamba* field. Such flocks as these must, however, be but rare, though droves of 8 or 10 and upwards are often met with. Major A. B. Burton informs me that an officer in the Hyderabad Contingent came across 17 birds together in the Raidan Doab, and Major R. W. Burton once saw 19 birds at Tuggali, on the S. M. Railway, East of Guntakul, though on the latter occasion the birds appear to have formed two flocks, one of 6 and one of 13. Numerous other correspondents have met with flocks of 10 or 12. On the other hand, solitary birds are constantly met with at all

times of the year, in the cold season, especially, the birds seem to be often seen singly, but even during the rains and breeding season cock birds are often seen alone. These are probably suffering from compulsory isolation, not having been able to attract any females and unable to forcibly attach the harem of any other male. Sometimes two or three such young males may be seen together in the breeding season, seemingly sympathising with one another for the absence of female society.

There is still no general description of the habits of the Great Indian Bustard better than that of Jerdon as quoted by Hume and others. He writes "The Bustard frequents bare open plains, grassy plains interspersed with low bushes, and occasionally high grass runnahs. In the rainy season large numbers may be seen together stalking over undulating plains of the Deccan or Central India. I have seen flocks of twenty-five or more, and a writer in the *Sporting Review* mentions having seen above thirty on one small hill. This writer states his belief that they are never seen in any district that is not characterized by hills as well as plains; but this, from my own experience I would merely interpret that they do not frequent alluvial plains, but prefer the undulating country; for I have seen them on extensive plains, where there were merely a few ridges or eminences, and nothing deserving the name of a hill close at hand. Towards the close of the rains, and in the cold weather before the long grass is cut down, the Bustard will often be found, at all events in the heat of the day, concealed in the grass, but not for the purpose of eating the seeds of the Roussa grass, as the writer above alluded to imagines, rather for the large grasshoppers that abound so there, and which fly against you at every few steps you take. During the cold weather the Bustard frequently feeds, and rests during the day likewise, in wheat fields. When the grass and corn is cut, and the bare plains no longer afford food to the Bustard, it will be found along the banks of rivers where there is long grass mixed with bushes, or the edges of large tanks, or low jungle where there is moderately high grass, or it wanders to some district where there is more grass, for though they do not migrate, yet Bustards change their ground much according to the season, and the supply of grasshoppers and other

insects. The hen birds, remarks the writer quoted above, generally congregate together during the rains, are very timid, and frequently, when a sportsman is pursuing a single one, she will attempt to seek safety, fatally for herself, in some large bush, particularly if the gunner turn aside his head, and affect not to see her at the moment of hiding. The cock-birds at this season feed a mile or so apart from the hens, and stretching their magnificent white necks, stride along most pompously. Besides grasshoppers, which may be said to be their favourite food, the Bustard will eat any other large insect, more especially *Mylabris*, or blistering beetle, so abundant during the rains; the large *Buprestis*, *Scarabaei*, caterpillars, etc., also lizards, centipedes, small snakes, etc. Mr. Elliott found a Quail's egg entire in the stomach of one, and they will often swallow pebbles or any glittering object that attracts them. I took several portions of a brass ornament, the size of a No. 16 bullet, out of the stomach of one Bustard. In default of insect food, it will eat fruit of various kinds, especially the fruit of the Byr (*Zizyphus jujuba*) and Caronda (*Carissa carandas*); grain, and other seeds and vegetable shoots.

"The Bustard is polygamous, and at the breeding season, which varies very greatly according to the district, from October to March, the male struts about on some eminence puffing out the feathers of his neck and throat, expanding his tail, and ruffling his wings, uttering now and then a low deep moaning call heard a great way off. The female lays one or two eggs of a dark olive green, faintly blotched with dusky. I have killed the young, half grown, in March near Saugor.

"The Bustard has another call heard not unfrequently, compared by some to a bark or a bellow, chiefly heard, however when the bird is alarmed. This is compared by the natives to the word *hook*, hence the name of *hookna*, by which it is known to the villagers about Gwalior. When raised, it generally takes a long flight, sometimes three or four miles, with a steady, continued flapping of its wings, at no great height from the ground, and I never found that it had any difficulty in rising, not even requiring to run one step, as I have many times had occasion to observe when flushing them in long grass of wheat fields. On the open

bare plains, it will sometimes run a step or two before mounting in the air. A writer in the *Bengal Sporting Magazine* asserts that he has known the Bustard ridden down, and that after two or three flights it is so exhausted as to allow of its capture. I imagine that a healthy bird would tire out the best horse and rider before giving in."

Referring to Jerdon's remarks on the "showing off" of the male bird at the commencement of the breeding season, Hume remarks:—"The way in which the male expands the throat at times during the breeding season is most extraordinary. Twice I have closely watched the whole process through binoculars. First the male begins to strut about, holding his head up as high as if he wanted to lift himself off his legs; then, after a few turns, he puffs out the upper part of the throat just under the jaws, then draws it in again, then puffs it again, and so on, two, three or four times, and then, suddenly out goes the whole throat down to the breast, and that part of it next the latter swells more and more; his tail, already cocked, begins to turn right back, over the back, and the lower throat bag gets bigger and bigger, and longer and longer, till it looks to be within six inches of the ground. All the feathers of the throat stand out, and looked at in front, he seems to have a huge bag covered with feathers hanging down between his legs, which wabbles about as he struts here and there with wings partly unclosed, and occasional sharp snappings of his bill. From time to time he utters a sort of deep moan, and stands quite still, and then off he struts again close up to the female, and then away from her. On both occasions that I witnessed these antics, the excitement seemed gradually to relax, and no connubialities resulted. Whether this is usually a prelude to such, or a mere nautch for the edification of the female, like the Peacock's grand display, I cannot tell, but I am inclined to believe the latter."

It will be seen from Jerdon's description, which I have above quoted, that the Bustard is capable, when necessary, of rising straight from the ground into full flight, at the same time there is little doubt that our Indian bird, like the European Great Bustard, prefers to run a few steps before springing into flight, though the facility with which it does this is a matter of opinion. Thus Capt.

A. H. Mosse writes :—"The big Bustard is very slow in rising and has to take 4 or 5 steps with outstretched wings before he succeeds in getting up into the air." Capt. C. Brownlow, on the other hand, writes "before rising from the ground, they ran only a few steps and rose with apparent ease." When once flushed, it flies well and strongly, though with but slow beats of the wing, and at a very much faster rate than those who have not shot at it would give it credit for. Those who have shot these fine birds soon find, however, that they fly quite as fast as smaller birds who appear to go at twice the pace and it is necessary to shoot well forward to bring them down.

In addition to the moaning call and the bark or bellow described by Jerdon, Capt. C. Brownlow mentions a third sound made by these birds. He writes to me about this as follows :—"I then saw a flock of six or seven feeding near a small village and managed to get within some 30 yards or so before they became alarmed and flew off. Whilst moving about before they were disturbed they kept up a sort of cackle."

The Bustard is a difficult bird to circumvent, affording as good sport as any game bird known, and calling forth all the cunning and patience of the sportsman.

Of course, there are occasions on which the bird's natural cuteness fails to keep it in its ordinary advantageous position in the open and the quantity of food obtainable in high crops sometimes entices it to its doom. Thus, as Mr. J. E. James records in "Game Birds," "the largest bag I ever knew was made near Malegaon, in the Nasik District, when an officer came upon a flock feeding in a field of Jowari which was above their heads. He walked them up and shot eight of them as they rose, like so many partridges."

So, also, Capt. Mosse remarks : "Occasionally the Indian Bustard may, I believe, be put up out of crops like a quail and bagged at short range. But my knowledge of him is confined to the open plains where he is ordinarily met with in these parts. He may be shot in two ways. First by stalking him with a small bore rifle, though stalking is hardly the correct term, owing to the absence of cover, which necessitates a perfectly open approach. If this be conducted with an air of indifference and by an indirect advance,

a shot may often be obtained at from 80 to 100 yards. A nearer approach is rarely possible unless there is some slight cover, grass or low bushes (for the bird I mean). In that case the Bustard will sometimes squat down flat, vanishing from sight in a marvellous manner, but unable to resist the temptation of now and then raising its head to see where you are. Now is the chance for the shot gun. Gradually lessen the distance by from 10 to 20 yards, then turn and run straight in, when, with any luck you may be able to get in both barrels at a fair range.

Mr. G. Sanderson, also, was apparently more fortunate than most sportsmen in inducing Bustard to wait for him in scrub jungle until he could get within shot. He says, *vide* Hume :—"The great Indian Bustard occurs somewhat plentifully throughout Mysore, in suitable localities, *viz.*, open plains in the vicinity of scrub jungles. I have seen five feeding together, three commonly. I believe that the Bustard in Mysore migrates. It is exceedingly wary. Its note, usually uttered before daylight, is a booming cry, not unlike a distant shout; hence it is denominated in Canarese the 'bird that calls like a man' (Arl-Koogina-Hukki).

"The Bustard feeds in stubble fields and open plains till about 10 a.m., as also in the afternoon. During the heat of the day it retires to low bush jungle. I have frequently shot Bustard by having markers posted upon commanding eminences within a circuit of three or four miles round their feeding grounds. The particular habits of the birds are generally well known locally, and when one has been marked down after its return from its morning feed, it may generally be walked up, within a few hundred yards of the place where it alighted. In the scrub jungle they frequently lie very close, and must be carefully looked for. Before I was aware of this peculiarity, I failed to find several birds. On one occasion a Bustard uttered its peculiar cry about twenty yards behind me. It had walked out of a small bush which I had passed within five yards, and uttered its note when standing on the ground."

Similar examples of a confiding disposition in the Indian Great Bustard must not, however, be *expected*, though they may be *hoped* for, by the man who wishes to bring them to bag. It will

be wiser on his part to start with the conviction that he will have to use patience, perseverance and brains before he can pat himself on the back as being a wiser bird than the one he is after.

Driving, such as is so often successfully carried out in the pursuit of the European Bustard, is not often resorted to in India, and the destruction of our Indian bird is more often accomplished by stalking and the aid of a small bore rifle. Even this, however, is but seldom possible in the truest sense of the word, for the bareness of the country in which the game is found and the general complete absence of all real hills or elevations prevent any approach under cover.

In the "Indian Field" 1904, Major R. W. Burton gave an interesting account of a stalk which ended in success. After some preliminary remarks, he says: "At last the white neck of the cock Bustard caught my eye some 600 yards away, and in a few moments, with the aid of field glasses, three others were distinguished not far from the first and all were busy feeding. It was most interesting to watch them stalking about in the stately way they have.

"Bustard have a keen sense of smell, and as any approach except down wind appeared impossible, there was nothing for it but to wait. In the course of half an hour the birds were tending towards some higher ground on which were a few small bushes. A detour under cover of a fold in the ground took me, without any particular precaution, to within 150 yards of these, and a crawl on hands and knees and elbows, and sometimes on the stomach—all through sopping wet plough land took me some 80 yards nearer. Sitting slowly up to see where my friends were, I saw a long white neck appear round one side of a bush, about 120 yards away, peering this way and that to see what strange green and brown beast it could be sitting in the field (my shooting suit was of the greenish-brown leather mixture, and much bespattered with mud). I sat like a carved image, as the least movement would be fatal, and that curious bird actually paced slowly on until 70 yards away without being able to make me out. Opportunity was taken as the bird paused for a moment behind a small bush, with long tufts of grass growing through it, to get the little .310 rifle to bear in

his direction with elbows on knees ready to fire. At last discovery appeared imminent, so taking careful aim at the lower edge of the breast I dropped him with a shot through the body. Loud hoarse grunts of alarm showed me the other birds were not far off, and on my standing up the last of them flew off from some 150 yards away.

“There is no finer bird than a male of the Great Indian Bustard and the delight in handling the magnificent plumage was mingled with a genuine feeling of regret—now the excitement was over that the stately bird would no more stalk proudly his native plains.”

In writing to me he adds that on another occasion he combined a stalk and a drive with great success.

“It was with reliable information of the Bustard being in considerable numbers that Major H. Greany, I.M.S., and myself took the train for a small wayside station of Tugalli, in January 1896. Within half a mile of the station we discovered 6 birds feeding among some stunted babul bushes and arranged for one of us to stalk and the other to lie up on the chance of getting a shot as the birds flew on. The stalk fell to my share and resulted in a successful right and left with S. S. G. at 60 and 90 yards rise, the other birds going straight over the Doctor who dropped one bird with S. S. G. from his right barrel and merely staggered another bird, as he had loaded the left barrel with No. 6, shot, being afraid to fire S. S. G. from the choke barrel of his best ‘Alexander Henry!’ The wounded bird carried on until out of sight, and we did not succeed in finding him. The three birds secured were all hens and weighed 17 lbs. to 18 lbs. each.”

Another correspondent, who desires to remain unnamed, sends me a very interesting account of a two days’ stalk after Bustard, which shows that success does not always attend even the hardest worker under the most advantageous circumstances. He writes: “The Great Bustard has always been an object of admiration to me, and I have spent many long days after him, sometimes with the success that makes a man feel above himself for days together, but more often, I must admit, with the failure that makes a man feel his smartness to be great depths below the bird he is after.

"In April, 1902, I had the good fortune to be stationed atan ideal place for Bustard in every way. Birds were remarkably plentiful, and though the ground was mostly very bare, it was rolling and even hilly in places, so that by taking advantage of the rises and dips and by making use of the tufts of grass, an odd Ber-bush or so, or of stones and rocks larger than usual, one could often carry out a genuine and successful stalk."

"Starting early in the morning, indeed, almost before it was light, I was soon on my shooting ground, but even at that time the heat was intense and already there was that shimmer in the atmosphere which foretold of the greater heat to come. Lying flat on the top of a stony ridge, the highest point in the neighbourhood, I brought my binoculars to bear on the various points of the horizon and was rewarded by seeing no less than three lots of Bustard, one consisting of eight birds, one of four and a third of two grand old cock birds. The fewer eyes to watch me, the greater the chance of getting close, so I decided to first try for these last two birds. They were a long way off, nearly a mile, so that for the first few hundred yards no very great precaution was necessary; moreover there was a crack in the ground—one could hardly call it a water-course—which led in the right direction for my stalk and by stooping low I could make use of this for a good quarter of a mile without much chance of being seen. Before making a start I located the birds as being about half-way between two stunted Ber-bushes about a hundred yards apart, and as these bushes were some two or three feet higher than the heads of the Bustard, they served as admirable marks which I could keep in view without the risk of trying to see the Bustard themselves. Down the water-course I went with success until I arrived at a place where it was too shallow to allow of my going any further except on all fours. Here, I wanted a further look for my game, so getting behind a tuft of grass, I gradually raised my head—covered with a helmet of the same colour as the stones which lay scattered in every direction—until I could peer between the withered stems. Both birds were still in the same place and were engaged in the most curious antics, bowing and scraping to one another, although there were no hens visible within miles of them.

Directly between myself and the Bustards the ground was quite bare, but a little to my left and some two or three hundred yards nearer, there were a few bushes and further on again were others I hoped to be able to make use of. Working my way on hands and knees up the rain crack, I got directly in line with the bushes, and after I had wiped the streaming perspiration from my eyes, continued, still on hands and knees, until I got behind their shelter. Arrived here, I found, I had to make my way in full view of the Bustards—now about 600 yards away—before I could get under cover of a big stone, whence I could again make my way to another clump of bushes. Down I went on my waistcoat and, yard by yard, covered 50 yards of open, halting for a few seconds whenever the birds looked my way. At last I got behind the stone and had a rest before recommencing another series of painful crawls which were to take me to within shooting distance of my game. The two Ber trees shewed up well and kept me on what I believed to be the correct line, and eventually I stopped under the shelter of a couple of bushes and some tufts of grass, which I had estimated to be within about 100 yards of the Bustard and within easy range for my little rifle. Having rested until my heavy breathing ceased I knelt up, and having mopped my face and brought my rifle to full cock, peered out. No birds! Kneeling up a little higher I looked further afield and then saw them strutting along some 200 yards beyond where they had been when first seen. Unfortunately, at the same moment one of them caught sight of me and after a second's hesitation ran a step or two and then launched on his wide pinions to be immediately followed by his companion.

"It was, however, still early, so waiting for my man to come up with my flask, I had a good drink and then once more we searched round the horizon for more birds. There they were, a flock of 8, probably the same I had seen in the morning, though they had wandered some distance since then. They appeared to be in an excellent position from my point of view for a stalk, just this side of a small rise which would keep them entirely out of sight until I should arrive within 50 or 60 yards of them. I accordingly got up and sauntered quietly away in the opposite

direction and so round for well over a couple of miles in a semi-circle until I had got the hillock between myself and them. I then walked about a quarter of a mile in their direction stooping lower and lower as the ground began to rise, until once more I was forced to go on hands and knees. In this way I got to within 300 yards of the top and was lying flat for a moment or two to recover my breath when, without any warning, two suddenly appeared over the crest of the hill coming straight towards me. I lay absolutely motionless, but it was useless. First one bird and then the other stopped, stretched out his head and neck, put it on one side so as to get a better focus, for a moment or two seemed to doubt whether I was a dangerous object or not and then, determined I was, they both took to flight accompanied by the remaining six birds on the far side of the hill.

"The sun was now high up and the heat intense so I made for the shade of some village trees, a weary two miles off and there I fed, drank, slept and read for the next four hours. After the rest we again set forth and it was not long before we again came upon some birds, two fine cocks, probably the same two I had tried for in the morning. The ground was favourable for a stalk and, after a repetition of the morning's work on hands and knees, ending with a crawl on my stomach for the last hundred yards or so, I got within 120 paces of the nearest cock. My only cover was a few scattered clumps of coarse grass, two or three feet high, so that I could not sit up to fire but, resting on my elbows, had to fire as I lay. Alas! the report of my rifle only resulted in both birds springing into flight and sailing away unhurt, though followed by another bullet, fired in despair.

"No further opportunities to miss or hit occurred and at dusk I made my way home a disappointed man.

"My next day's work was as unsuccessful as that already reported, practically all day I was in sight of Bustard but it seemed impossible to work within shot. Once early in the morning I had stalked a solitary bird with success and had only a few yards more to cover when he took it into his head to change quarters and join a scattered flock nearly the opposite side of the plain. A stalk of this flock followed and I was again just congratulating myself

on success when I blundered on a hen Bustard that was squatted in some Ber-bushes not twenty yards from me. Of course, off she went followed by the rest of the flock which I did not again see that day. Two other stalks proved failures. In the first I could not get within 300 yards of my birds, and in the second I could only get just within that distance and a shot, though it raked the feathers off the back of what seemed the largest cock, did no real harm.

“The following year I was again in the same place in February and managed to bag 5 fine cocks in one day, though I must confess that one bird was a fluke. I had had the usual painful crawl after a flock and eventually got to within sixty yards of the nearest bird which I shot through the body and then, to my delight saw another bird, not by any means in a direct line with it, and some four or five paces distant, fall struggling to the ground. When I went up to them the first bird was dead but the second was—as I afterwards found—only shot through the shoulder of the wing, quite incapacitated from flying but, as I feared, fully able to escape my running. Running away, however, was one of the last things it appeared to think of, and when I came close up to it, it assumed a most truculent air and actually advanced beating its unwounded wing noisily up and down uttering its deep cry at quick intervals. There was no stick within miles of me so *faute de mieux* I was obliged to put another shot into it.”

“On the same day I had another most unusual bit of luck, getting again two birds out of one flock. I had had my first shot and dropped my bird at about 100 yards distance when the others, instead of at once taking to flight, actually paused long enough for me to get a second successful shot. My fifth bird was got in the middle of the day as we were returning to our starting point for we came suddenly on it over the crest of a hill, and as its back was towards us I was enabled to drop down and crawl up the hill and then kill it with an easy shot at less than forty yards.”

It is probable that this Bustard is not as common now as it used to be some 50 years ago when Jerdon wrote his “Birds of India” for I doubt if it would be possible for any sportsman to emulate the gentleman mentioned therein who “killed above one

thousand Bustards with his rifle." At the same time we must remember that those were the days when tigers averaged 12 feet and it was a poor shot who could not get his brace or two before *chota hazri*.

Its area of habitat as given by Jerdon is much the same now as it was then and such notes as I have had sent me shew that their numbers have not much changed in any particular place during the last 25 years. Thus in 1879 Hume quotes Mr. G. Vidal as saying "This species is found very sparingly in the Eastern districts of the Poona and Satara Zillas." He then goes on to say that he only saw three specimens in five years in Satara, but that in Poona there are two or three places where they may be found yearly. After this Hume quotes Davidson as reporting it to be becoming yearly rarer in these parts. So that having been so scarce 32 years ago we should now expect it to be exterminated yet Lieut. E. G. Phythian Adams, of the 80th Infantry, writing in May 1910, informs me he knows "of its existence in the following districts: Satara, Poona, Sholapur, where it is uncommon."

Col. L. L. Fenton, I should note, says that "some thirty years ago Bustard were fairly common in the Sholapur District where they used to breed. I have also shot them in the Rabinnur Taluka of the Dharwar District. A few, I also came across in the Naladgi, now Bijapur District."

Mr. J. E. James reported it as common in Hume's time in Khandeish and Nasik and all my correspondents in that part of India say that it is so still.

From the Deccan reports are conflicting, but my correspondents who have gone most carefully into the matter tell me that the number of birds differ greatly in different years and one writer adds that it is quite possible for a sportsman who does not know the district to be there a year and leave with the impression that the Bustard is but a rare straggler therein, whereas the man who has lived some years in the Deccan and knows exactly when and where to look for these grand birds may consider them almost common.

On the whole, therefore, we may hope that our finest Indian Game bird is not on its way to extinction and that its wariness

combined with its open habitat may enable it to survive any persecution it has, or may have, to endure. At the same time the Great Indian Bustard requires protection just as much as our other Game birds do, for it is much sought after by snarers and bird catchers. I have had several letters from correspondents describing the way these birds are noosed in all districts and all Provinces. The principal way in which they are caught is that described by Hume, who writes "In parts of the Punjab, and doubtless elsewhere, the native fowlers are very expert in noosing them. A small party is described in the middle of a plain. The fowler, with a blanket folded over head and shoulders, native fashion, (or at times driving a trained bullock before him) and a large supply of pegs and gut nooses at his girdle, circles slowly approaching nearer and nearer, round the flock. By little indications inappreciable to us, he discovers the directions in which if slightly and cautiously pressed, the Bustards will walk. Across the line of march, sauntering slowly backwards and forwards, and pretending to cut and collect grass the while, the fowler pegs down rows of nooses. Then, taking a wider circuit, he begins to approach the flock from the opposite side not walking at them, but sideways, at right angles to the line he wishes them to take, passing nearer and nearer at each lap, never in the least alarming them, but quietly edging and pressing them towards the nooses. Sometimes he lets them walk right on to the nooses; generally when close to them, he drops his blanket, throws up his arms, and rushes at them. They always in these cases run a few paces before they rise, and though occasionally all escape, generally one, often two, and sometimes three or four, are caught by one or other leg. The chief skill consists in walking them exactly across the lines of nooses, which are never, according to my experience, more than fifty yards long, and usually much less."

As will be seen by Jerdon's description this bird is practically omnivorous; but to the items of diet mentioned by him must be added rats, mice and similar small animals, young birds and much vegetable matter, such as the shoots of young mustard, young wheat, lemon grass, etc.

Two or three writers to me have mentioned this Bustard's

curious taste for snakes and the natives generally give it credit for being a constant slayer and devourer of those reptiles.

As regards the breeding season of *Eupodotis edwardsi* it is not easy to lay down any very definite period. Hume says: "The Great Indian Bustard in Upper India lays mostly in July and August, but the breeding season varies a good deal according to the rainfall, and we have found eggs as early as the first half of March, and as late as the first half of September. In Southern India, according to Jerdon, they lay during the cold season.

"The eggs are placed on the ground, at the base of some bush or tuft of grass, in a small depression, generally unlined, often thinly lined with a few straggling blades of grass. The situation varies; sometimes the nest is in an open waste, sparsely dotted with a few herbaceous shrubs, often in the stubble of the giant and bulrush millets, and still more often in clumps and patches of high thatching grass, or the dense soft lemon grass so characteristic of the favourite haunts alike of this Bustard and the Houbara.

"My impression is, that the birds lay only one egg. But sometimes two eggs are found pretty close together, and either the females not unfrequently lay very close to each other, or when a female does lay more than one egg, she deposits the second some little distance from the first. Khan Nizam-ud-din Khan has taken more than a hundred of these eggs with his own hand, and he never found two eggs side by side. Where, as not unfrequently happens, two are within a yard or two of each other, he believes that they belong to different birds, and that this is a fact he has in one or two cases proved by snaring both females. I have only myself seen five nests, each containing a single egg. I can, therefore, say nothing positive on this subject.

"The eggs vary very much in size and shape. They are all more or less oval, but while some are moderately broad and slightly pointed at one end, others are long ovals, exactly similar at both ends, and others again are long and cylindrical, of the same size and shape as the egg of the great Northern Diver, figured by Mr. Hewitson; and I have one specimen that, both in colour, shape and size, might have been the one from which his plate of the egg of the European Bustard was taken. The shells

are very thick and strong, closely resembling those of the Sarus in texture, and like those of this latter species, the eggs very commonly exhibit pimples and rugosities at the large end, so much so that, out of sixty eggs now before me, only seven are perfectly free from such imperfections. Some of the eggs are dull and with little gloss, the whole surface being closely pitted with small pores similar to, but fewer than, those in the Peafowl's egg, while other specimens are brilliantly glossy. The ground colour varies much. Typically it is a sort of drab colour, but it is often earthy brown, dingy olive green, pale olive brown, pale reddish brown, and, although rarely, even pale leaden blue. The markings vary in extent, number and intensity; sometimes they are pretty deep reddish brown and clearly marked blotches, but more usually they are pale reddish brown clouds and streaks, sometimes so faint as to be mere mottlings, and sometimes, though rarely, altogether wanting. Occasionally, the markings form an irregular blotchy cap at the large end.

"Out of sixty eggs in my collection, no two are precisely alike. In length they vary from 2.75 to 3.42 and in breadth from 2.05 to 2.45, but the average of sixty eggs is 3.11 by 2.24."

I have in my collection a very fine series of eggs of this species taken by Mr. Harrington Bulkley and the times at which these eggs were found extend considerably the period given, as above, by Hume. The majority were taken in August and September, but many were taken in October and one in November. On the other hand I have three Deccan eggs taken in June and an egg from Cutch taken in January. Then I have records of eggs from Poona in April; Sholapur, April and May; and Guzerat, June and November. I have, therefore, eggs actually in my collection, or authentic records of eggs, taken in every month of the year except December, February and March. I think we may say that, very roughly speaking, the Great Indian Bustard breeds principally from August to November, but that many birds breed earlier and later than this, and that the breeding season varies very much in different localities, these not necessarily very far apart.

As to the number of eggs laid there is little to add to what Hume has noted. Undoubtedly the number normally laid is only

one and the exception to this rule is of the rarest. I have, however, in my collection one pair of eggs which are said to be from the same bird, but even here I must record the fact that they were found about a foot apart, in the same small beaten down patch in a field of lemon grass. The two eggs are of the rich brown variety and are so exactly like one another in every detail that it seems probable that they are a pair.

My eggs, though the series is much smaller than Humes, have a rather larger range of variation in colour, doubtless because Mr. Harrington Bulkley's series represents the variations picked out of a very much greater number which passed through his hands. Hume calls his eggs in ground colour *typically* a drab: I should call mine *typically* dull pale reddish brown, certainly in five out of six brown is the dominant colour of the egg. I have one egg which is a unicoloured sienna brown, and it is only when held up to the light that the very faint markings can be seen. Many eggs are a stone grey or drab in general appearance, others are a yellowish stone colour or olive yellow, a few dingy olive green and one a beautiful pale sea green. The markings are as described by Hume, but I have none which could be said to be boldly marked.

The majority are very highly glossed and very few have no gloss at all. My longest egg is 3.71" and my broadest 2.35", whilst the shortest and most narrow are respectively 3.0" and 3.11" and the average of 45 measured is 3.21" by 2.29," my eggs therefore averaging considerably larger than Humes.

Our Plate of *Eupodotis edwardsi* is an excellent one, but the colouration of the back in both male and female is too red and should be more of a sandy buff. It must also be noted that the white eye-brow, as shown in the female, is not a sex difference, but only an individual characteristic.

Genus *HOUBARA*.

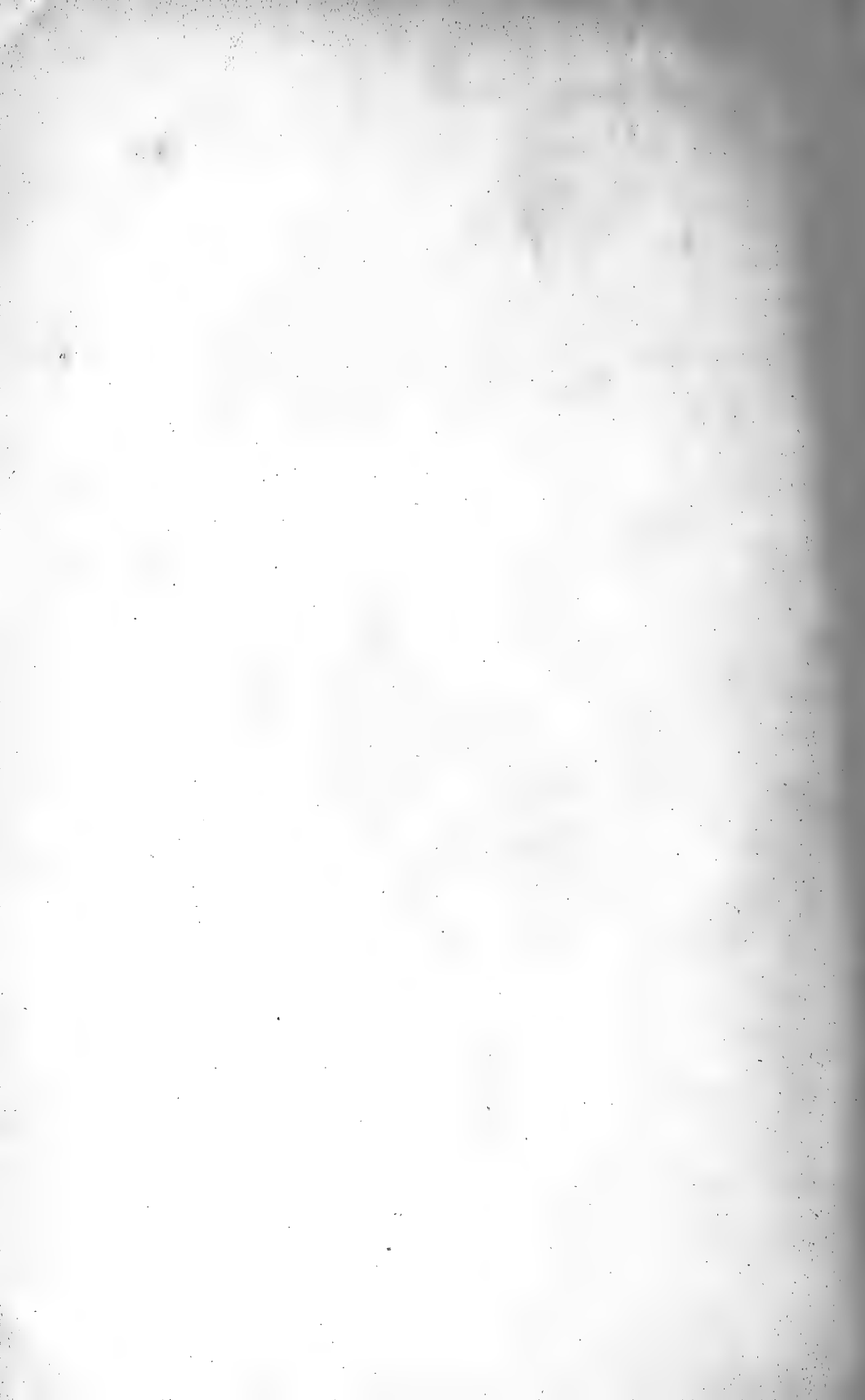
In the species of the genus *Houbara* the sexes are alike, the female differing only from the male in being slightly smaller. It is distinguished from all other *Otididæ* by the presence of a curious crest which consists, not of a collection of feathers, either few or numerous



♂

♀

THE HOUBARA (*Houbara macqueni*).



massed together, but of numerous isolated feathers, thinly webbed at the base and completely separated and independent of each other. There is a thick ruff of black and white feathers on either side of the neck, and the feathers of the lower neck are also lengthened.

The genus contains but two species, the one, *Houbara macqueenii*, inhabiting Central Asia and visiting Northern India in winter and, the second, *Houbara undulata*, inhabiting the countries surrounding the Mediterranean.

HOUBARA MACQUEENII.

Macqueen's Bustard.

Otis macqueenii.—Gray & Hardw., Ill. Ind. Zool., ii, p. c. 47; Hutton, J. A. S. Beng. xvi, p. 786; Blyth, Cat. B. M. As. Soc., p. 258; Gould, B. of Asia, vii, pl. 58; Hume, Ibis, 1868, p. 241; Blanford, East Persia, ii, p. 287; Heath, Jour. B. N. H. Soc., vi, p. 372.

Houbara macqueenii.—Jerdon, B. of Ind., iii, p. 612; Stoliczka, J. A. S. Beng. xli, p. 258; Hume, Str. Feath, i, p. 227; Adam, ibid, p. 393; LeMes, ibid, iii, p. 379; Butler, ibid, iv, p. 9; Hume, ibid, p. 9; Butler, ibid, v., p. 231; Hume & Marsh, Game B. of Ind, i, p. 17; Hume, Str. Feath. vii, p. 67; id, ibid, viii, p. 3; Butler, Cat. B. of Sind, p. 56; Hume, Cat. No. 837; Doig, Str. Feath, ix, p. 281; Murray, Vert. Faun, Sind, p. 218; Barnes, Jour. Bom. Nat. His. Soc., vi, p. 12; id, B. of Bombay, p. 321; Sharpe, Cat. B. M., xxiii, p. 318; Blanford, Avi. B. I., iv, p. 197; Sharpe Hand.-L. B. M., i, p. 175; Oates, Eggs of B. M., i, p. 89; Finn, Indian Waders, p. 122; Oates, Game B. India, i, p. 405.

Eupodotis macqueenii.—Gray, Hand-L. B., iii, p. 9.

Vernacular names.—*Tilur*, Punjab; *Talur*, Sindhi; *Hobara* or *Obara*. P.

Description.—*Adult male*.—Forehead, sides of the crown and whole upper plumage sandy-buff, very finely vermiculated with black, the general aspect being sandy; on the mantle and scapulars the black vermiculations form into fairly definite black bars across the feathers, but these are absent on the lower back and rump; crest of long, narrow feathers, white on the basal and black on the terminal halves; upper tail coverts like the mantle but more rufous. Tail sandy rufous, the vermiculations almost absent at the base but

increasing towards the tip where they are as numerous as on the back and a little coarser. Four broad bars of grey, the two apical bars darker, and becoming quite black on the two central feathers, similar in character to the black vermiculated bars on the back; all the rectrices, with the exception of the two central ones, tipped white.

The feathers on the nape are curiously downy and those in the centre are often without any vermiculations. Sides of the head whitish buff with black striæ; chin and throat buffy white; fore neck pale buff, finely vermiculated with black; on the upper breast the buff changes to a beautiful french grey and the vermiculations almost disappear; lower tail coverts buffy white, much splashed and marked with brown, this colour forming into well marked bars on the outer webs of the outermost feathers; remainder of lower parts white. Primaries black, the bases white and the outer webs buff, this colour being most pronounced on the first primary, the inner webs white for two-thirds of their length, outer secondaries the same but with no buff on the outer webs and with the tips white; inner secondaries like the scapulars; lesser wing coverts like the back, median coverts the same but albescent; greater coverts with broad, black sub-terminal bars and white tips; winglet black.

Both males and females have a ruff of feathers starting from the sides of the neck and, to some extent, from the hind neck, the latter are sparse and thin, mixed black and white but with the former predominating; the feathers at the sides form two long tufts, the inner are white on the basal halves and black on the terminal halves which are much broader; outside these the feathers are white, of the same breadth throughout and generally longer than the broader black feathers, here and there may be seen a few faint bars of grey or specks of black. The feathers of the sides of the breast are very full and long forming a continuation of the ruff.

The feathers of the crest may measure as much as 3·2" in length whilst the longer feathers of the ruff are sometimes well over 7" and those of the breast up to, or even over, 3".

In old birds the grey on the breast appears to become purer and more extensive whilst the vermiculations become fewer and fewer.

"The irides vary from pale to bright yellow.

"The legs and feet are pale yellow, never clear and bright, mostly with a dingy or greenish, or plumbeous tinge, at times creamy; the bill is blackish or dusky above, paler, usually greenish or yellowish on gape and lower mandible.

"Length, 28 to 30·25; expanse 51·5 to 57·75; wing 15 to 16·1; tail from vent 8·5 to 10·25; tarsus 3·4 to 3·9; bill from gape 2·3 to 2·4. Weight 4 to 5½ lbs." (Hume).

The measurements of the few males I have measured have been as follows: wing 14·3" to 16·2", tail 8·5" to 9·5"; bill, culmen 1·35" to 1·5" and from gape 2·1" to 2·35"; mid toe 1·65" to 2·0".

Sharpe gives the measurements as "Total length about 28 inches, culmen 1·8, wing 15·7, tail 9·5, tarsus 4·9." These measurements are very curious as he makes out the female to be a much smaller bird, yet gives a longer wing measurement for the female than for the male. The measurement given for the tarsus 4·9 is probably a slip or misprint for 3·9.

Adult female.—"Differs from the male in being very much smaller and in having the crest and the ruff of the neck more feebly developed, the freckling on the foreneck and lower throat appearing to be rather coarser than in the male. Total length 23 inches, culmen 1·65; wing 16; tail 7; tarsus 3·7." (Sharpe).

My measurements for the female are as follows: wing 13·5" to 15·0"; bill from front on culmen 1·2" to 1·35" and from gape 1·8" to 2·2"; mid toe 1·56" to 1·85".

Hume records the measurement as "Length 25 to 27·5; expanse 47 to 51; wing 14·25 to 15·25; tail from vent 7·75 to 9·25; 3·15 to 3·6; bill from gape 2·0 to 2·5; weight 2 lbs. 10 ozs. to 3 lbs. 12 ozs."

Young birds.—"Can always be recognized from the adult female which they most resemble, by the sandy coloured arrow head markings which pervade the whole of the upper plumage. The frill is always very small, the crest on the head is represented only by a few elongated feathers, which are only recognized by somewhat coarser black freckling and the white of the primaries is distinctly inclined to sandy buff; in some specimens there is an indication of a black band on the feathers of the fore neck." (Sharpe).

Distribution.—The Houbara is, so far as is yet known, only a cold weather visitant to the Plains of India, being found throughout the Punjab, Rajputana, Sind, Cutch and Northern Guzerat. Oates defines its Eastern limit as a line drawn from Delhi on the Jumna River to Baroda, but Hume has recorded having shot one himself in the Meerut District, east of the Jamna and doubtless other occasional birds will be met with as far East as this bird.

Outside India it is found in West Central Asia as far West as Mesopotamia, whence it straggles commonly into South-Eastern Europe and more rarely into Northern and Western Europe, as far as the British Isles, Persia, Central Asia, as far South as Afghanistan and Baluchistan (throughout the year) and the highlands of West and North-West China, breeding as close to Indian limits as the Persian Gulf and Afghanistan and Baluchistan.

The fact that our Indian Houbara has been so much confounded with the African bird, *Houbara undulata*, has prevented many persons from collecting specimens of the Houbara when met with on the border lands of the two species and the dividing line between the two has not yet been satisfactorily worked out. The B. M. possesses so few specimens of either sort, except, for those Indian killed specimens of *Houbara macqueenii* in the Hume collection, that they do not much help in this respect.

Dresser, in his "Palæartic Birds" gives the habitat of our bird as "N.-W. India, Afghanistan, Persia, Central Asia; a rare straggler to Europe and has been met with in Germany, Poland, Finland, Oland, Belgium, Holland and four times in Great Britain." The African Houbara he gives as extending to Palestine and Armenia.

The Houbara arrives in India as early as the end of August. Hume records the shooting of one on the 27th of August and Butler records the arrival on the 30th of that month. The latter however, says: "The end of August is exceptionally early for their arrival. The main body do not appear until about the first week in October. A few pairs were breeding at Henjam, Persian Gulf, at the beginning of April, 1877." Butler's record refers to Northern Guzerat and in the Northern Punjab they are reported to arrive at much the same time; a few stragglers appear in early September.

but not many are to be found until very late in that month or early in October.

Their departure takes place in March and early April, though Doig's men reported their still being in the Eastern Nara, Sind, in May and June. Doig also adds that "a man voluntarily informed me one day that he had seen the eggs of the *Tilloor* in the desert at a place near where my man had seen the birds."

Major A. R. Burton informs me that in the Zhob Valley and the Loralai District they are found from September to March.

This Bustard, like the others of the order, is more or less gregarious, but never seems to collect in very large flocks. Hume states that he has put up as many as twenty birds in a flock, but most of my correspondents speak of seeing small flocks of three to five or six and I have received no information of flocks as large as that seen by Hume. Major Burton, in his letter above referred to, says that the birds were fairly plentiful in the Zhob Valley, but that he never put up more than eight birds in a flock. On the other hand birds are found very often either in pairs or alone.

Hume was very successful in shooting this Bustard and he records, in "Game Birds," that in 1867 he killed no less than 83 birds, 47 cocks and 36 hens, in one week in November. He writes in his usual interesting manner on the easiest way to obtain this bird. He says: "The Houbara greatly prefers running to flying, and when the weather is not too hot, will make its way through the labyrinth of little bushes which constitute its home at a really surprising pace. So long as the cover is low, its neck and body are held as low as possible, but as soon as it gets where it thinks it cannot be seen, it pulls up, and raising its head as high as possible, takes a good look at its pursuers. Not unfrequently it then concludes to squat, and though you may have been, unobserved, watching it carefully whilst it was only watching others of the party coming from an opposite direction, it becomes absolutely invisible the moment it settles down at the foot of a bush or stone. Once it has thus settled, especially if it is hot and about noon, you may walk past it within ten yards without flushing it, if you walk carelessly and keep looking in another direction.

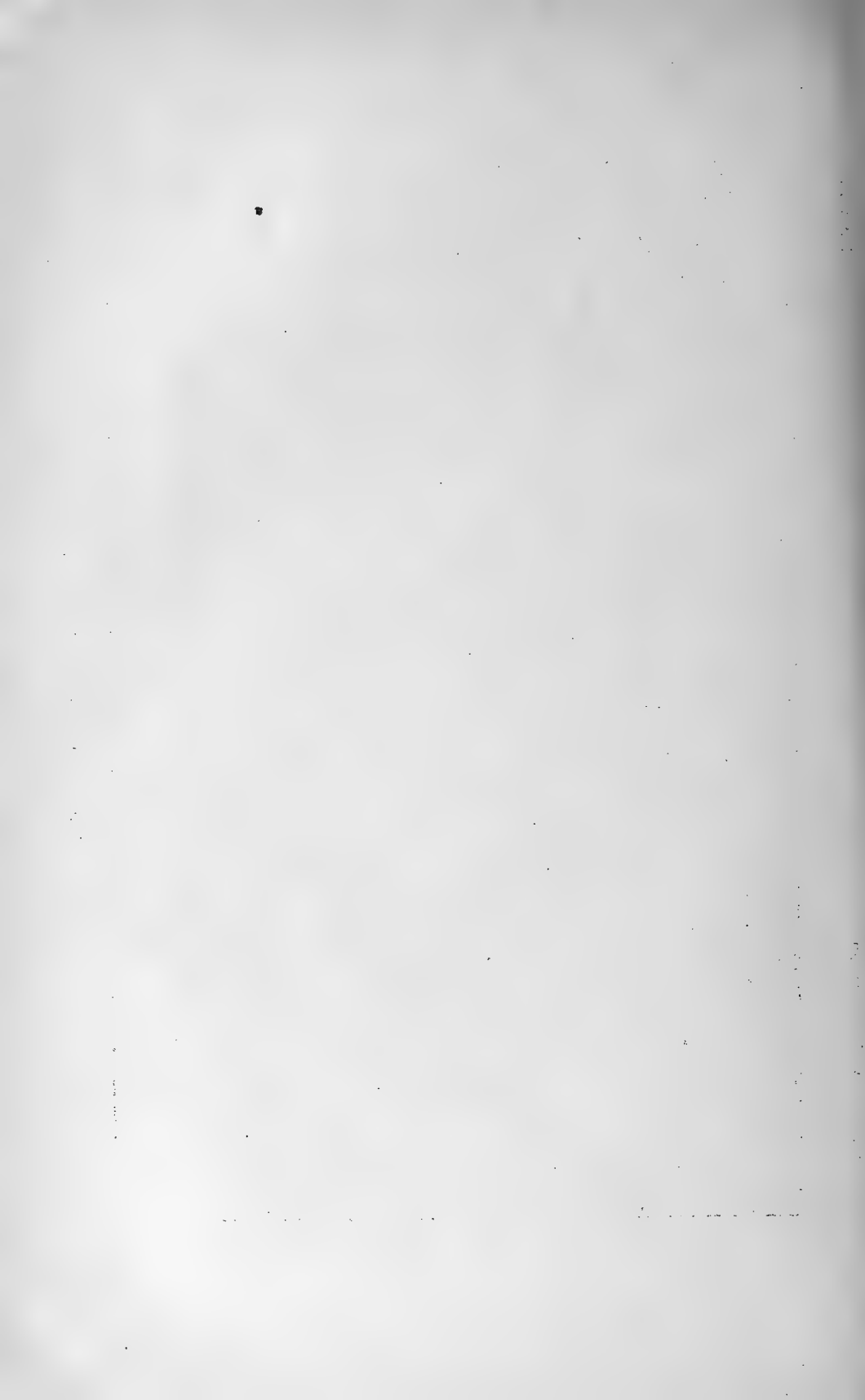
"But it is weary work trudging on foot under an Indian sun after birds that run as these can and will, and in the districts where they are plentiful, people always either hawk them or shoot them from camels.

"Off a camel a large bag is easily made, and as, whilst after these Bustards, you get from time to time shots at Antelope or Ravine-deer, Quail, Partridges, and on rare occasions, a Great Bustard also, it is not bad fun, though rather monotonous, like the scenery that surrounds one.

"Taking the camel at a long, easy, six-miles-an-hour trot, across one of those vast wildernesses they affect, you will not be long before raised high up as you are on camel back, you catch sight of one or more Houbara feeding amongst the bushes. To them camels have no evil import; everybody uses them; none but the veriest pauper walks, every one rides, and rides camels. The peasant going out to plough his field rides on one camel and puts his plough on the other, which, with its nose-string fastened to the tail of the one he rides, trots along complacently behind. When, therefore, the Houbara see you coming along on a camel, they only move a little aside, so as to be out of your line of march, and you at once begin to describe a large spiral round them, so that, while appearing always to be passing away from them, you are really always closing in on them. Sometimes, if the time be early or late, or if the day be cold or cloudy, long before you are within shot, they start off running, and if you press them further, ultimately take wing, flying heavily, and soon re-alighting and running on, never, so far as I have seen, taking the long flights that the Great Bustard does, and never fluttering and skylarking in the air as do the little ones. Generally, however, if the time be between 10 and 4, and the day bright and warm, as your spiral diminishes the birds disappear suddenly. They have squatted. Still you go on round and round, closing in in each lap, and straining your eyes, usually in vain, to discover their whereabouts; suddenly perhaps from under the very feet of the camel, up flutters one of the birds, and after a few strides, rises, to fall dead a few yards further on, as they are easy to hit and easy to kill. Of course, I suppose a trained camel to be used,



THE HOUBARA (*Houbara macquerei*).



otherwise, what with flies, keeping up a perpetual twitching of every part of the beast's head, neck and body and its natural suspicions that you and your gun are up to no good, you will find it by no means difficult to miss even a Houbara, especially if you do not remember always so to slew your camel round as to have the bird well on your left side.

"At the first shot, all the Houbara that are at all close usually rise, but after shooting a brace right and left, and having them picked up and slung I have known a third blunder up from within a few yards.

"Often, especially when you are out alone, and after breaking up a large flock (which it is always best to do) are working a single bird, you close in, and in until you reach the very bush by which you last saw it, and yet can find no trace of it. You pull up, as this generally starts the birds, but sometimes even then nothing is to be seen. The way they will squat at times on an absolutely bare patch of sand is astonishing; their plumage harmonizes perfectly with the soil, and you will have a bird rise suddenly, apparently out of the earth, within five yards of you, from a spot where there is not a blade to cover, and on which your eyes have perhaps been fixed for some seconds. This is especially the case about mid-day, when the sun is nearly vertical and no shadow is thrown by the squatting bird. Sometimes they try another plan; they get behind a single bush, and, as you circle round, they do the same, always keeping the bush between themselves and the sportsman; here, unless the sun is quite vertical, their shadow projected on the ground, apart from that of the bush, is sure, at certain positions in the circle to betray them, and a shot through the bush brings them to bag.

"In some parts of the country the Houbara greatly affect fields of mustard and other crops yielding the oil-seeds of commerce, of which there is a vast variety, known by half a dozen different names, in almost every province.

"When these fields are well grown, and are, say, a little higher than the bird itself stands, exceptionally good sport may at times be obtained.

"They cannot run here, the growth is too dense, and a line of

guns and beaters, sweeping a large field of this kind into which a flock has been marked, will often account for the whole party flushing them like so many Pheasants out of a dense turnip field, with buckwheat lines, along a cover side."

Mr. M. M. Currie has sent me the following interesting note on the occurrence of the Houbara in Ludhiana and Dhera Ismail Khan. "Bustard,"—*i.e.*, the Lesser Bustard or Obara, commonly called "Tilur" in the Punjab, was pretty common in the Dhera Ghazi Khan where I shot a certain number in the cold weather of 1908-09. They were most common in the dry tract at the foot of the Salimans where they seemed to be especially fond of lying up in a kind of coarse grass locally known as Ghammi. Later in the year they haunt the fields sown with oil-seeds (*taramira*). I have also seen them in the low-lands down by the Indus. The usual number seen together was three or four, but once or twice I have seen as many as a dozen together. The method of shooting most often employed is with camels. The sportsman dismounts and taking cover behind the camel, continues to approach in circles till within range when he advances towards the spot where the bird is lying till he puts it up.

"The best bag I ever saw made in this manner was by a companion of mine who got six birds one day, whilst I, not so fortunate, shot but one. It is said to be possible at times to walk them up in the oil seeds, but I never did so with any success."

It is perhaps quite as often hawked as shot, though naturally one does not expect to make as big bags in the former as in the latter way.

Major Drake Brockman thus describes a day Houbara hawking near Peshawar.

"Some of the pleasantest days I can remember having passed in India were spent at Peshawar in the cold weather of 1893 and 1894.

"Apart from the excellent pack of hounds there and the good sport we had I think that even more pleasant days were those we spent out hawking Houbara on the Jamrud Plain in the company of Mr. Donald, Asst. Commr., and Colonel Aslam Khan, of the Khyber Rifles.

"The Jamrud Plain, a few miles out of Peshawar is covered, to some extent, with low sparse scrub jungle and small boulders intersected with numerous dry water courses, mostly small, but some of a considerable width. The road runs right through this plain and on either side the latter stretches away to the foot of the hills, where far away—about 10 miles distant—can be seen Fort Jamrud, situated at the mouth of the famous Khyber Pass."

"After an early breakfast we would drive out in the keen morning air to our rendezvous, some five miles or so out on the Jamrud road, to which our ponies had already been sent on ahead to wait for us. Here also Col. Aslam Khan would generally wait for us, together with a few men of the Khyber Rifles, to act as an armed escort party and also to be extended in line on either side of us so that they might act as beaters.

"Having mounted our ponies we would strike off across the Plain in the direction of the Minitini Fort, the men with the Falcons—they were Peregrines we usually used for this sport—on either side of us, and the remaining sepoy extended as I have said.

"After going in this manner for perhaps the best part of a mile, sometimes much less, up would get a Houbara, generally about 80 yards or so in front of our line. Immediately he was spotted one of the falcons was unhooded and thrown off, and as soon as he sighted the Houbara a grand race would begin. The Peregrine, like an arrow from the bow, would hurl itself in pursuit of its quarry and we would hasten after both, galloping for all we were worth, and galloping across the boulder strewn and broken plain was exciting enough in itself, though it was wonderful the way our little country-bred ponies kept their feet and got over the ground."

"Ride, however, as hard and as recklessly as we could, the two birds would leave us soon behind, although the Houbara with the steady beats of the wing seemed to be going comparatively slowly,"

"At last the Falcon would be within striking distance of the Houbara, there would be one lightning-like swoop from the former from far above, and then, if he struck true the tragedy was over for the Bustard, and riding up we would find them in some small open

place and the Houbara dead, the hawk still grasping it on the ground. The men would then come up and secure the Falcon, give it a tit-bit to eat and then hood it again."

"Remounting our ponies and once more extending our line we would go on in the same way and, if luck favoured us, might perhaps get another Houbara. Not every time, however, were we successful, for sometimes the Houbara would succeed in eluding the hawk once and yet again, sometimes, indeed, escaping altogether."

"By the time we had worked across the plain our appetites would remind us that it was time for lunch so, having selected a suitable spot with some shade if possible, we would dismount and partake of the good cold fowl and Pathan *roti* provided for us all by Col. Aslam Khan."

"But the winter days soon close in, even in this land of sun, and, after we had rested, a glimpse at the Western sky showed us that if we wanted any sport *en route* it was time we once more got into our saddles. Accordingly, mounted once more, we would continue to beat back to the place where we had ordered our traps to wait for us. If our luck was still in the ascendant we might get another run or rather flight, but we generally considered that two birds in a day was a good day's average. Arrived at the road we would say good-bye to Col. Aslam Khan and drive homeward, well wrapped up, for the winters in Peshawar are very cold, pleasantly tired after a delightful day in the most perfect winter climate in Northern India."

"I am sorry to say that owing to the swift flight of Houbara and Hawk we were never up quite in time to see exactly what happened at the kill or to see the hawk actually striking the Houbara. There seemed to be always a lot of feathers about, and it looked as if there might have been a bit of a tussle between the two, but they might also merely have been knocked out of the Houbara from the force with which, when struck by the falcon, it fell to the ground. We noticed, too, that the Houbara always seemed to emit some secretion for there was generally a mess of this around."

Mr. F. J. Mitchell in *epistola* also mentions this curious habit of the Houbara. He writes "the Houbara when pursued often rises

like a Heron under similar circumstances. If he can get immediately over the pursuing hawk he squirts him with a stinking gummy (anal) liquid which sticks the hawk's feathers together so that he cannot fly. Sometimes the hawk falls like a stone when thus squirted and he has to be washed with warm water before he can fly again."

This habit seems to be common to the members of this family most of which pass this offensive fluid when attacked or wounded.

Hume says that sometimes very large bags of Houbara are made; and that in Pairi District in favourable years "any man could shoot twenty in a day," and General Marsten, while Superintendent of Police in the Kurrachee District, shot, I believe, forty-eight (and some people say fifty-eight) on one occasion."

As regards the food of the Bustard there is little to add to what Hume has recorded. They are more or less omnivorous, as are the other birds of this family, but they are far more vegetarian in their diet and are not nearly as gross feeders as the larger species. They will, when driven to it by stress of hunger, sometimes eat small reptiles, etc., but they do *not* eat these in *preference* to green food, and they are very partial to young wheat and similar crops and are said sometimes to cause considerable injury to such crops in the Punjab.

Their flight is more like *Otis tarda* and *Eupodotis edwardsi* than like *Otis tetraz* or the Floricans. They progress by slow steady beats of the wing and cover the ground at a very good pace, and when being hawked turn, twist, or drop to the ground with wonderful rapidity. As a rule they run before taking to wing but can take to flight quite easily without any preliminary walk, and when flushed in thick crops rise like pheasants and are then easily shot.

The Houbara breeds in Afghanistan, Baluchistan, Persia and the Persian Gulf. It has never yet been found breeding actually within Indian limits, but it is quite possible it may yet be found to breed occasionally in Sind. H. E. Barnes records: "I feel sure that a few at least remain to breed, both in Sind and Cutch; a friend of mine avers that he has seen eggs in the latter place, but as he did not preserve them, he may have made a mistake, but he is

too good a sportsman not to know a Houbara when he sees one. Mr. Doig had excellent reasons for believing that the Houbara bred in the desert between Godra and Renahoe." Barnes then refers to Col. Butler's remarks in Str. Feathers, which are as follows: "Mr. Scroggie, however, who resides at Henjam, imparted an important piece of information which I must not omit, and that is that one or two pairs of *Houbara macqueenii* were breeding in the Island and that about six weeks before our arrival, i.e., about the first week in April, a pair (♂ & ♀) were shot there, and that he extracted a perfect egg from the oviduct of the female and put it under a hen to hatch, but that subsequently it was destroyed by rats. I am inclined to think that the greater number of Houbara that visit Sind in the cold weather breed in Persia and Afghanistan."

The nest, which is merely a depression in the sand or earth, seems generally to be placed in the open though under shelter of some scrubby bush or patch of grass, failing these, in amongst stones or boulders.

The eggs seem to be three in number in a full clutch though sometimes two only may be laid. Oates thus describes the egg of this species in the British Museum: "The eggs of the Indian Houbara are elliptical in form and possess very little gloss. The ground colour varies from stone colour to dull olive-brown, and the markings are more distinct than is usually the case with eggs of the Bustards. They consist of spots and blotches of rather dark brown and pale underlying purple, very evenly distributed over the whole shell. Specimens measure from 2.3 to 2.55 in length, and from 1.65 to 1.85 in breadth."

Eggs in my own collection answer the above description well, but I have one clutch of three from the Altai which has the ground colour a very distinct olive-green, indeed, they are the greenest eggs I have in my collection of any Bustard. The markings are rather indefinite as a rule and even the darkest are often somewhat smudgy in character.

The eggs in the British Museum are dated 25th April, Euphrates Valley, and 15th May and June from Altai Mountains. Eggs in my own collection from the latter place are dated 12th June

and 24th June and from Afghanistan the 22nd April. Their breeding season would seem to range therefore from very early in April to the middle of June.

Our coloured Plate of this bird is both beautiful and correct. The attitude shown thereon is a semi-courting one; when the bird reaches the full frenzy of his passion the tail is thrown back well over the back and the wings are trailed until they touch the ground, and in some cases the ends of the feathers are elevated and the shoulders depressed whilst the wings are forced outwards so as to form a sort of screen extending on either side of the breast.

The collar on the breast of the bird in the picture is almost absent and generally shews a good deal more than this.

(To be continued.)

SOME NEW INDIAN RODENTS

BY

R. C. WROUGHTON, F.Z.S.

(With a Plate.)

In working out the specimens collected by the Society's Mammal Survey I have found two animals which are unnamed, *viz.*—a hare from Khandesh and a most interesting long-tailed mouse, which I can refer to no known Genus. Further in the course of comparison I have found, in the National Collection, series of specimens closely related to the common Indian Field-Mouse (*L. ooduga*) which require a name. This paper deals with the descriptions of these three species.

LEPUS SIMCOXI, sp. n.

The Khandesh Hare.

A hare about the size of *nigricollis* and *ruficaudatus*, distinguishable at sight by its smoke grey nape.

General colour above pinkish buff, much mixed with black, individual hairs of the middle back white at base (10 mm.) followed by a dusky ring (4 mm.), remainder (9-10 mm.) pinkish buff with a short black tip; below pure white; on the lower back all buffy colouring disappears and the hairs are greyish white with black tips. Face coloured like the back, cheeks and chin and commencement of throat pure white, lower throat dark buffy. Ears drab. Limbs outwardly pinkish-buff. Nape grey. Tail above blue-black with only the slightest buffy tinge, below pure white.

I can detect no important constant difference between the skulls of *nigricollis*, *ruficaudatus* and the present species. The nasals in the present species are narrow and equally broad in their whole length, but being laterally bent downwards, anteriorly, give the idea of a sharp pointed muzzle.

Dimensions of the type (recorded by the Collector).—Head and body 480; tail 89; hind foot 112; ear 105. Skull: greatest length 94; basal length 76; zygomatic breadth 40; greatest length of





DATE 7.8.11 SEX ♀ No.

Cremnomys cutchicus 102.

Loc. Shalwa, Butch.

ALT. 500

COLL. B.N.H.S.

DATE 25.9.11

SEX ♀

No. 11.3.13.9

Pyromys priestleyi, Thos.

Loc. Venuvah, Nogar Parka Ten

ALT. T & P; 5000 S. 1000

COLL.

B.N.H.S.

DATE 27 April 1911 SEX

B.M. No. 11.3.13.10

Grynomys gleadowi Murray

Loc. Thar & Parkal

E. Priestley (C)

ALT. Send

B.N.H.S. (P)

DATE 16.7.11 SEX ♀

No.

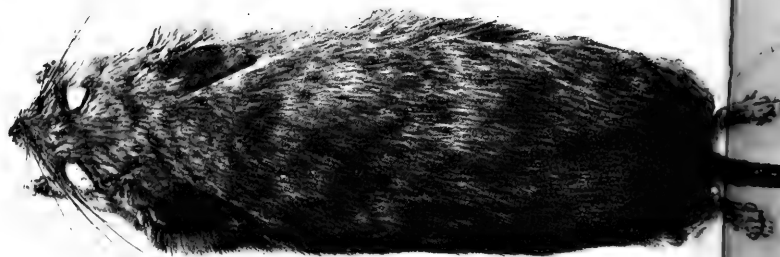
Millardia mellada

Loc. Nokania, Butch.

ALT. 200

COLL.

B.N.H.S.



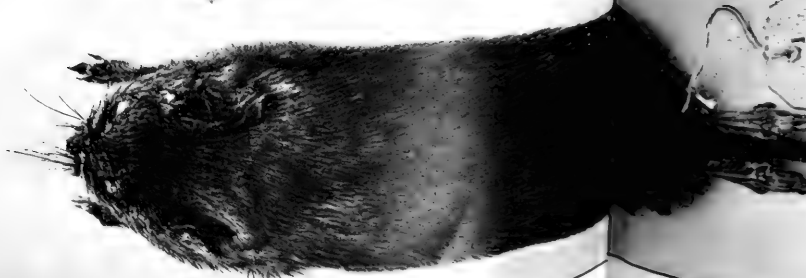
DATE 7.8.11 SEX ♀ No.
Cremnomys cutchicus 102.
 Loc. Chudra, Chitral
 ALT. 5000 COLL. J. H. H.



Type DATE 25.9.10 SEX ♀ No. 11.3.13.9
Pyromys priestleyi Thos.
 Loc. Verburah, Nagar Port Blair
 ALT. 1000 COLL. S. H. H.



DATE 27 April 1911 SEX ♂ B.M. No. 11.3.13.10
Grynomys gleadowi Murray
 Loc. Thar + Parkal E. Priestley (C)
 ALT. 5000 Send B. N. H. Soc. (P)



DATE 16.7.11 SEX ♀ No.
Millardicia mellada
 Loc. Nokania, Chitral
 ALT. 2000 COLL. S. H. H.

nasals 38; posterior breadth of nasals 19; apparent width of nasals anteriorly 12; palatal foramen 23; diastema 28; upper molar series 16.

Hab.—Khandesh (Type from Edalabad.) Alt. 1,000 ft.

Type.—Adult female, B.M. No. 11, 8, 7, 1. Original number 99. Collected by Mr. Crump, 22nd April 1911, and presented to the National Collection by the Bombay Natural History Society.

The material available for comparison with *ruficaudatus* is very meagre. In the original description of the type from 'Bengal' Is. Geoffroy describes the nape as 'roux'. All Hodgson's Nepal and Sikkim specimens have a buff nape, and Jerdon describes the nape of the hare of Bengal as "pale sandy rufescent;" that of *nigricollis* is black, so that this character alone suffices to distinguish *simcoxi* from other hares of the Indian Plains. It is encouraging to find this quite distinct new species in the first collection of the Society's "Mammal Survey," and I have much pleasure in naming it after Mr. A. H. A. Simcox, I.C.S., Collector of Khandesh, who took so much interest in the work of our Collector in his District.

LEGGADA DUNNI, sp. n.

The Northern Field-Mouse.

A *Leggada* smaller than *booduga* and markedly differing from that species by its paler drab colouration.

General colour above drab, individual hairs slate-grey for basal two-thirds of length, remaining one-third buff; below white, in some specimens the belly is pure white, but in the majority including the type, the hairs have short grey bases. Face like back. Tail above like back, paler below. Hands and feet white.

Skull short and broad, as compared with that of *booduga*, the anterior cusp or ridge on the front of first molar, characteristic of *Leggada*, plainly marked.

Dimensions of type:—head and body 58; tail 60; hind foot 12; ear 11. Skull: greatest length 18.5 (20); basilar length 15 (16); greatest breadth 9.5 (10); nasals 7 (7.6); interorbital breadth 3 (3.4); braincase breadth 8.6 (8.5); diastema 5.3 (6); palatal foramina 4 (5); molars 3 (3).

(Note—The figures in brackets are taken from the skull of an old female obtained by myself at Dharwar and consequently a topotype of *booduga*.)

Hab:—Punjab (Type from Ambala.) Alt. 900 ft.

Type:—Old male. B. M. No. 9, 4, 6, 36. Collected 1st January 1909, by Major H. N. Dunn, R.A.M.C., and presented to the British Museum. Seven specimens were sent by Major Dunn, from Ambala, a very even series. The British Museum has also two specimens collected by Major E. J. F. Birrell, R.A.M.C., at Rawalpindi, both these are young individuals, they must be placed in this species. In the Cutch Collection of the B. N. H. Society's Mammal Survey a single specimen was obtained, which is also *L. dunnii*.

CREMNOMYS, gen. nov.

Sole pads 6, sixth, or proximal, elongate as in *Epimys*. Fifth hind toe long, reaching to the end of the first phalanx of the fourth. Mammæ 1-2=6.

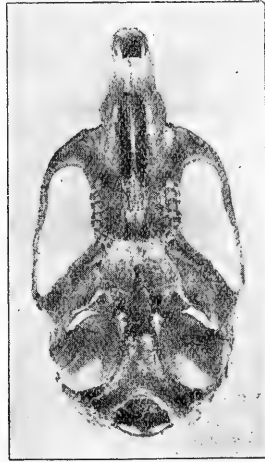
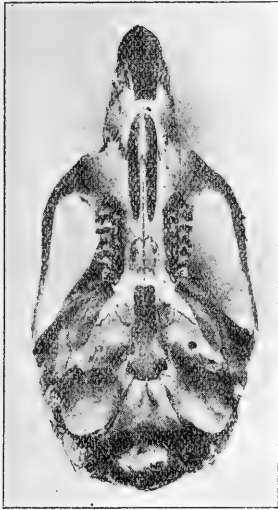
Skull rather flat; braincase broad, narrowing suddenly anteriorly; bony palate not produced posteriorly behind 3rd upper molar, mesopterygoid fossa with sub-parallel margins. Molars as in *Millardia*.

Type:—*Cremnomys cutchicus*.

Mr. Thomas recently described in this Journal (XX. p. 996) a group of three closely allied genera, viz.—*Millardia*, *Pyromys* and *Grypomys*. The present is a fourth member of this group. The following comparative table gives at a glance the principal distinguishing characters of each:—

	<i>Millardia</i> .	<i>Pyromys</i> .	<i>Grypomys</i> .	<i>Cremnomys</i> .
Pads of hind foot ..	5	6	4	6
Fifth toe of hind foot	short.	long.	short.	long.
Tail	medium.	short.	short.	long.
Mamm. Formula ..	2-2=8	4-2=12	1-2=6	1-2=6
Profile of skull ..	normal.	arched.	normal.	flat.
Bony palate ..	normal.	produced backwards.	produced backwards.	normal.
Mesopterygoid fossa	normal.	narrowed.	narrowed.	normal.
Upper molars ..	normal.	normal.	3rd molar modified.	normal.

The following figures show the two characteristic types of palate formation in this group of Genera (for details *see* table above). The figures are double natural size.



CREMNOMYS CUTCHICUS, *Wroughton*.

GRYPOMYS GLEADOWI, *Murray*.

I have used, above, the expression "bony palate produced backwards" as a convenient description of the formation referred to, it is, however, not technically correct; the effect is not so produced but by the 'roofing in' of the posterior nares, by the partial drawing together of the margins of the mesopterygoid fossa.

The plate is intended to illustrate life-size, representatives of the four genera. Unfortunately Museum specimens, especially those prepared by amateurs, rarely reproduce exactly the natural size of the animal, the body skin being almost always stretched. In the present case *Millardia* and *Cremnomys* are only slightly too large, and the size of the others may be very fairly correctly deduced from the proportionate size of their feet.

CREMNOMYS CUTCHICUS, sp. n.

The Cutch Rock-Rat.

In size, fur, and colour resembling *Millardia meltada*, but at once distinguishable from that species by its remarkably long tail and long fifth hind toe.

Size about as in *Millardia*. Fur long, soft and silky. General colour above 'drab'; individual hairs dark slate-grey with buff tips (a considerable admixture of long all black hairs); below pure white; face and tail coloured like back; hands and feet pale.

Dimensions of the type:—head and body 117; tail 141; hind foot 24; ear 20.

Skull:—greatest length 33; basilar length 25; greatest breadth 15·5; braincase breadth 14; interorbital breadth 5; nasals 15; diastema 8·5; upper molars 6.

Hab:—Cutch.

Type:—old male, B. M. No. 11, 10, 18, 1. Collected on 20th July 1911 by Mr. Crump, and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained over a score of specimens of this fine new species. At first I was startled by the discovery of such a long tailed animal in a treeless country like Cutch, but Mr. Crump notes that the specimens were taken amongst rocks so the adaptation is to rock and not tree climbing. In reference to this I have chosen the Generic name from the Greek 'cremnos' meaning a rocky scarp. I have much pleasure in naming the species *cutchicus* in honour of H. H. the Rao Kenghaji of Cutch, who takes such a keen and intelligent interest in Zoology and who has specially interested himself in the Mammal Survey of the Society.

THE PALMS OF BRITISH INDIA AND CEYLON,
INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S.J.

PART VI.

(With Plates XXVI—XXXII, and text-figures 20—23).

(Continued from page 86 of this Volume.)

LIVISTONA, R. BR. PRODR. III. 123.

(When Richard Brown discovered this genus of majestic and graceful palms, he dedicated it to one of the great promoters of English horticulture, viz., Patrick Murray, Baron of Livistone, the founder of the Botanic Garden of Edinburgh.)

Bl. Rumph. II, 48, t. 95, 96 (Saribus).—Jacq. Fragm. t. 11, fig. 1. (Latania).—Kunth Enum. Pl. III, 241.—Mart. Hist. Nat. Palm. III, 239, 319.—Griff. Palms Brit. Ind. 127, t. 226 A, B, C, D, append. 23.—Miq. Fl. Ind. Bat. III. 57, Suppl. 591—Becc. Males, I. 84.—Kurz. For. Fl. II, 525—Benth. Fl. Austr. VII, 145.—F. Muell. Fragm. Austral. VIII, 221—Wendl. & Drude Linn. 39. 192, 226.—Benth. & Hook. Gen. Pl. III, II. 929, 97.

Tall palms; trunk annulate. Leaves orbicular, flabellately plicate, split to about the middle into bifid narrow lobes; petiole long with spinous margins. Spathes many, tubular sheathing. Spadices interfoliar, long peduncled, erect, fruiting pendulous, loosely paniced. Flowers minute, hermaphrodite. Sepals 3, rounded, imbricate. Corolla 3-lobed, coriaceous, lobes valvate. Stamens 6; filaments subulate, united in a ring; anthers cordate. Ovary of 3 nearly free carpels; styles short, free or coherent; stigmas minute; ovules basilar, erect. Drupes 1-3,

globose oblong or ellipsoid ; style subterminal. Seed erect, ventral face hollowed ; albumen equable ; embryo dorsal.

Species about 17 ; Tropical Asia and Australia.

CULTIVATION IN EUROPE.—The species of *Livistona* are mostly stove palms. They grow best in a compost of two parts loam and one of peat, to which a little sand may be added. Much water is required throughout the summer. The seeds should be sown in sandy soil, and placed in a gentle bottom heat. Several species are admirably adapted for various decorative purposes, and especially for subtropical gardening.

* INDIGENOUS SPECIES.

LIVISTONA JENKINSIANA, Griff. in Calc. Journ. Nat. Hist. V, 334 ; Palms Brit. Ind. 128, t. 226 A & B ; Hook. Fl. Brit. Ind. VI, 435 ; Brandis Ind. Trees 656.

NAME.—Toko Pat (Ass.).

DESCRIPTION.—Trunk 20-30 feet high. 6-7 inches in diameter, rough towards the apex from the adhering bases of the petioles, with a thick, round crown. Leaves 6-7 feet long, reniform flabelliform, greatest breadth 5-6 feet, length from the apex of the petiole 3-3½ feet, divided into about 70-80, obtuse, bilobed segments, of which the extreme lateral ones are the deepest, being 18 inches long, while the central ones are scarcely half that length, under-surface glaucous cæsious. Petiole channelled above, armed almost to the summit ; ligule cordate. Spadices 2-3 feet long, axillary ; branches a span or a foot long, dichotomous opposite the ends of the spathes ; lowermost branchlets 2-3 times divided, the other simple. Spathes chesnut-red, sometimes split, concealing the greater part of the peduncle, scurfy outside, the one next the first branch 1-1½ foot long, 3 or 5 keeled, with a large, oblong, deeply bilobed, split limb. Flowers small, several together, sessile or raised on small tubercles, greenish, ebracteate. Calyx short with a broad base, cup-shaped, with 3 short rounded teeth with membranous margins. Corolla about twice as long as the calyx, divided to

a short distance from the middle into 3 triangular segments. Stamens 6, united in a ring. Filament short, setaceous from a very dilated base. Anthers oblong, versatile. Pollen lanceolar with one fold. Ovary obconical, yellow, with a depressed, red spotted apex; carpels cohering by means of a short, trisulcate filiform style. Stigma simple. Ovule solitary, erect, anatropous. Drupe $\frac{3}{4}$ -1 inch in diameter, reniform globose, slightly attenuate at the base, of a leaden blue colour, marked on one side with a depressed whitish line. Seed erect, presenting on the side corresponding with the above line on the fruit, a broad raphe-like line. Albumen horny, opposite the centre of the above line deeply excavated; cavity filled with a spongy substance. Embryo opposite the excavation or situated in the centre of the dorsal face.

HABITAT.—Upper Assam: Gubrow Purbut; common throughout Assam, but most plentiful in the Nowgong district; Naga Hills. Sikkim, lower hills and outer valleys.

USES.—“This palm is an indispensable accompaniment of every native gentleman’s house, but in some parts it is rare, and the trees are then of great value. The leaves are in universal use throughout Assam for covering the tops of doolees (palanqueens), and the roofs of boats, also for making the peculiar hats, or rather umbrella-hats (jhapees) of the Assamese. For all these purposes the leaves are admirably adapted from their lightness, toughness, and durability.” (Jenkins).

CULTIVATION IN EUROPE.—This palm is a beautiful greenhouse plant.

LIVISTONA SPECIOSA, Kurz in Journ. As. Soc. Beng. xliii, II, (1874), 196, 204, t. 13, 14; For. Fl. II, 526; Hook. Fl. Brit. Ind. VI, 435; Brandis, Ind. Trees 656.

NAMES.—Taung tan, Taw tan (Burm.)

DESCRIPTION.—Trunk 50-70 feet; all parts glabrous; leaves palmately flabellate, about 6-7 feet across each way, plaited; the petiole at the base up to an inch broad, armed with strong, sharp, falcately curved, flattish, blackish spines, the lower spines up to $\frac{1}{2}$ inch long and longer by 3-4 lines broad at the base; sheaths dividing

into netted fibres; leaflets all (the lateral ones up to half of their length, the central ones higher up) connate in a blade, linear, sharply 2-cleft at the apex, the ribs compressed, prominent, the veins rather visible and transverse. Flowers small, solitary, or by 2 on a nipple-like, very short and thick pedicel, racemose-spicate, forming a much-branched, smooth, panicle-shaped, 2-4 feet long spadix, furnished at the base and along the primary axis with large, fuscous, quite smooth spathes. Sepals and petals hardly 1 line long. Drupes elliptically obovoid, $\frac{2}{3}$ to nearly 1 inch long, dark blue, smooth, 1-seeded, seated on the short, thick, indurated perianth, jointed with the nipple-or disk-shaped, very short peduncle.

HABITAT.—Frequent in the evergreen tropical forests of the eastern and southern slopes of the Pegu Yoma; Chittagong; Upper Tenasserim.

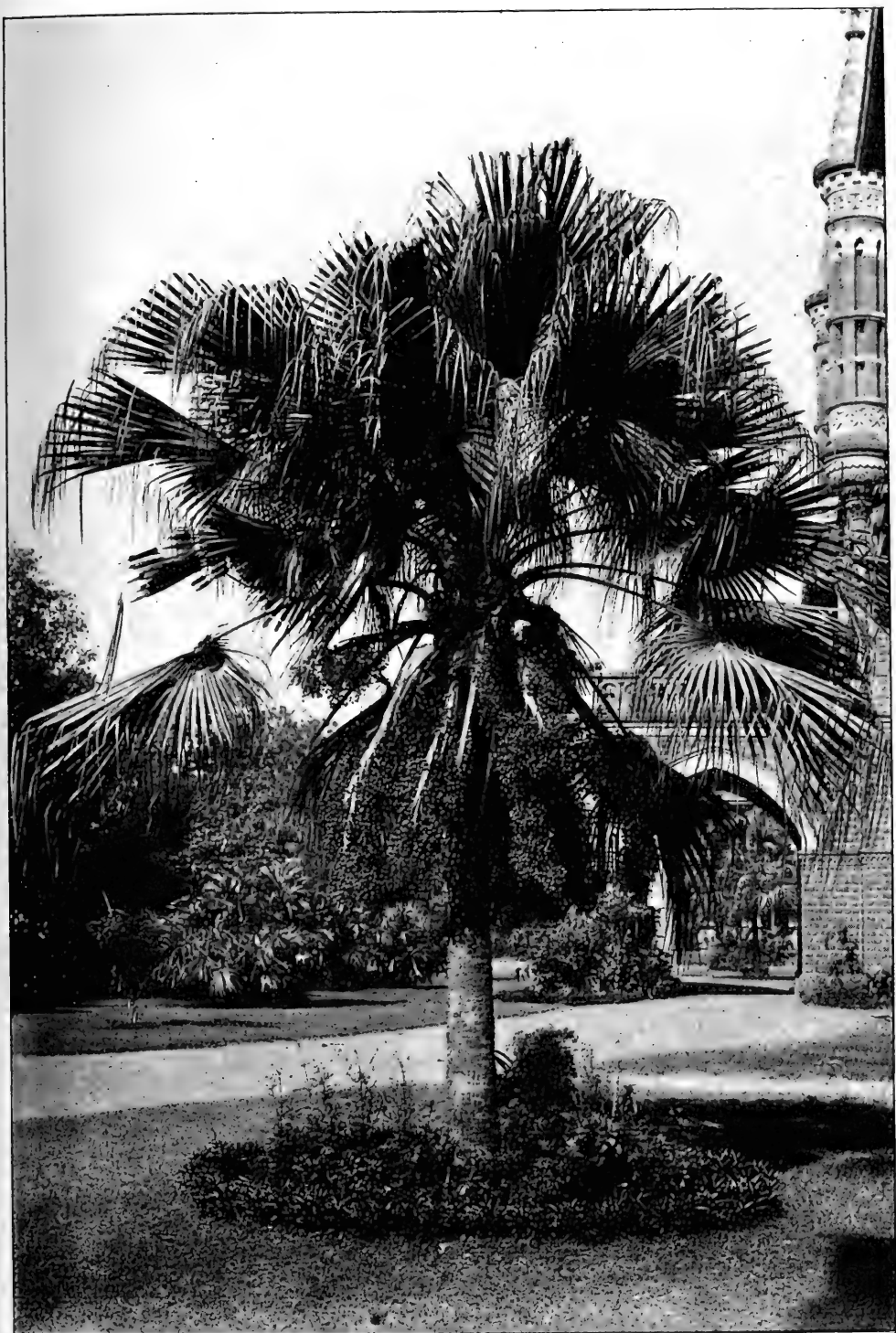
FLOWERS.—In March and April.

* * INTRODUCED SPECIES.

LIVISTONA CHINENSIS, R. Br. Fl. Nov. Holl. 268; Mart. Hist. Nat. Palm. III, 240; Drude Palmae in Nat. Pflanzenf. II, 3:35.—*Latania Chinensis*, Jacq. Frag. Bot. 16, t. ii, fig. 1.—*Latania borbonica*, Lam. Encycl. III, 411; Willd. Spec. Pl. IV, 878; Spreng. Syst. Veg. II, 623.—*Livistona Mauritiana*, Wall. in litt. 1831.—*Saribus*, Bl. Rumphia II, 49.

NAME.—Chinese Livistona.

DESCRIPTION.—Stem 20-30 feet high, stout, obscurely annulate. Crown round, leaves reniformly flabellate, 4-6 feet in diameter, much plicated and also conduplicate along the centre; segments 50-60, and more, linear-lanceolate, acuminate; the lateral ones much the narrowest, 2 feet, or 2 feet 2 inches long, their divisions about 1 foot long. Petiole 6 feet long, 6 inches broad, triangular, plane above or slightly concave towards the margins, armed from the base to about the middle with compressed-subulate, horny, brown spines; at the base a network of brown fibres. Ligule ovate-trigonus, concave, acute, green. Spadix paniculate-ramose,



CHINESE LIVISTONA (*Livistona chinensis*, R. Br.).

spreading, surrounded at the base and the primary branches by spathes, glabrous or slightly villous. Peduncle less than 1 inch thick; the upper part irregularly divided; the last branches 3-5 inches long. Basilar spathes, compressed, tubular, with the apex bifid; segments triangular, woody-coriaceous, longitudinally grooved. Secondary spathes lanceolate, convex on the ventral side, apex bifid and obliquely open, membranous-coriaceous, villous. Flowers small, white, of an unpleasant smell, usually 4 together. Calix subcampanulate, with 3 rounded teeth having membranous margins. Corolla campanulate, larger than the calix, divided below the middle into 3 cordate, erect segments. Stamens 6, included; filaments compressed, united at the base, free in the upper part, those opposite the petals a little larger; anthers small, ovate, dorsifixed below the middle, bifid at the base, apex rounded; pollen elliptic. Ovary small, scarcely half as long as the corolla, 3-carpellary, carpels more or less united; ovules erect, elliptic, one or two usually smaller than the third. Style trigonous. Fruit-bearing spadix nodding, with sub-secund branches. Berry usually one, rarely 2 or 3, olive-shaped, oblong, dull-blue, 7 lines long and $4\frac{1}{2}$ wide. Seed oblong, greyish, on a longitudinal section reniform, intrant process sub-central; embryo opposite to this a little below the centre of the dorsal face, looking downwards.

GERMINATION.—According to Gatin the cotyledonal petiole forms quite in the beginning a swelling just outside the seed. The radicle remains for a long time the principal root, but later on lateral roots are developed which, as to their size, equal or surpass the principal one. The first vegetative leaf is reduced to a sheath.

HABITAT.—China and Japan.—Cultivated in gardens.

FLOWERS in January and February.

CULTIVATION IN INDIA.—“This is perhaps the commonest and finest fan palm in Indian gardens. Its grand fan-shaped leaves gracefully disposed on long petioles, armed with short recurved spines, and rising from a network of brown fibre, render it very attractive. The length of the petiole varies with the position of the plant, being longer in slight shade than in the open. The

palm does well with ordinary border treatment throughout India if watered freely during dry weather." (Woodrow.)

CULTIVATION IN EUROPE.—This palm is quite hardy in Cornwall and nearly so in many less southern districts. In winter the tree is satisfied with a mean temperature of $46\frac{1}{2}^{\circ}$ F.

Goebel's analysis of the ash of the leaves gives an idea of the food required by the palm :

	<i>Young Specimen.</i>				<i>Adult Specimen.</i>	
Silicia	35,804	36,437
Phosphoric Acid	4,823	5,408
Aluminium and Ferric Oxide				..	6,666	6,605
Lime	6,259	20,931
Magnesia	1,060	5,482
Soda	1,679	traces
Potash	18,434	18,387

DeKerchove had excellent results by adding to the soil 7 parts of assimilable nitrogen, 30 parts of bone phosphate and 50 parts of torrefied animal substances.

Many amateur gardeners in Central and Northern Europe have been sadly disappointed when buying this palm. There are professional gardeners who keep this palm in the hothouse during summer and the plant, though naturally adapted to the temperate house, grows rapidly and acquires great beauty. If, after that, the palm is transferred to the dry drawing room where, besides, the heat of the soil is wanting, the tips of the leaves begin to wither and the stalks of the forming leaves become shorter and shorter, and after a short time no trace of the former beauty is left. If the Chinese *Latania* is expected to do well in the drawing-room, early and careful adaptation to its future conditions is required.

USES.—Fans are made of the leaves, and rope of the fibrous sheaths of the leaf stalks.

ILLUSTRATION.—The photograph reproduced on Plate XXVI was taken by Mr. Phipson in the garden of the Cama Hospital, Bombay. The overhanging tips of the segments of the leaves give the palm a very graceful appearance. Numerous bunches of fruits, which by their weight bend down the stalks of the spadices, are hiding the upper portion of the straight cylindrical stem.

LIVISTONA ALTISSIMA, Zoll. in Tijdschr. Nederl. Ind. Vol. 14, (1857), 150.—*Saribus* n. sp.? Zoll. Verz. p. 78.

DESCRIPTION.—Stem 80 and more feet high, slender, about $\frac{2}{3}$ foot in diameter, obsoletely annulate, cinerascens. Habit and conglomeration of leaves similar to that of *L. rotundifolia*, Mart. Leaves palmatifid; lamina cordate-orbicular, a little longer than broad, undivided at the base, plicate; segments about 80, outer ones shorter and narrower, $1\frac{5}{6}$ feet long and $\frac{7}{4}$ inch broad, divided for about $\frac{3}{4}$ of their length, bifid; laciniae acute with acute sinuses, intra-radial nerves acutely carinate and thickened near the sinus; petiole subrecurved, unarmed, usually about 5 feet long, $\frac{2}{3}$ inch broad at the base. Spadix recurved, sub-nutant, unarmed, compound, up to 6 feet long, glabrous, fuscous. Spathe scarcely 1 foot long. Fruit globular, about the size of a small cherry.

HABITAT.—Sunda Islands.

USES.—The wood is hard like iron; it is used for rafters.

CULTIVATION IN EUROPE.—*L. altissima* is a very beautiful palm. Its original home being in the Sunda Islands, it is natural that the palm does not grow in Europe except in the hothouse. The stem remains covered for a long time with the bases of the leafstalks.

LIVISTONA SUBGLOBOSA, Mart. Hist. Nat. Palm. III, 319.—Miq. Anal. Ind. II, 7; Flor. Nederl. Ind. III, 59.—*Saribus subglobosus*, Hassk. Tijdschr. Nat. Gesch. IX, 176, 172; Cat. Bogor. 65.—*Saribus rotundifolius* Bl. Rumphia II, 49, tab. 96 (quoad folium tantum).

DESCRIPTION.—Petioles elongate, densely armed with spines, especially in young specimens, leaves suborbiculate, flabelliform-palmatifid; segments usually united beyond the middle, bifid; laciniae linear elongate, pendulous. Spadix compound paniculate, stout. Drupes subglobose, black-violaceous.

HABITAT.—Java.

LIVISTONA ROTUNDIFOLIA, Mart. Hist. Nat. Palm. III, 241.—*Corypha rotundifolia*, Lam. Encycl. II, 131; Willd. Spec. pl. II, 201;

Spreng. Syst. Veg. II, 138. No. 2; Roem. Schult. Syst. Veg. VII, 2., p. 1309, No. 2; Hayne, Term. Bot. t. 11, f. 1; Houtt. I, t. 2, f. 2.—*Licuala rotundifolia*, Blume in litt. et in Roem. Schult. Syst. Veg. VII. 2, p. 1305, No. 5—*Saribus rotundifolius*, Blume Rumphia II, 49, t. 95, 96 (excl. folio tab. 96).

NAMES.—Wocka (in Termate and Celebes); Saligi, Pohon Sadang (Java); Saribu (Macassar Strait).

DESCRIPTION.—Stem 40-50 feet high, 1-1½ foot and more in diameter, erect or slightly bent, obscurely annulate. Leaves 3-5 feet in diameter, suborbicular; segments between 60 and 90, united in the lower third; each segment bifid to the middle; petiole 6 feet long, lower part armed with strong compressed spines; spines with a conical base, almost ½ inch long. Spadix 3-5 feet long, hanging from between the leaves, porphyry-red. Spathes compressed-cylindric, obliquely truncate. Branches of the spadix decompound, the last branchlets spreading, 3-8 inches long. Flowers 3-4 aggregate, small, globose, yellow. Calyx tripartite, segments broadly ovate, obtuse, concave, keeled on the back. Corolla tripartite, segments triangular, a little larger than the calyx. Filaments broadened at the base; anthers subrotund. Ovary turbinate, trisulcate, 2 carpels abortive; styles connate; stigma simple. Berry depressed-globose. Endocarp thin, brown. Seed globose, ferruginous.

HABITAT.—Malay Archipelago.

USES.—The cellular tissue of the central part of the stem furnishes sago (In the Malayan language 'sago' means bread or flour).

CULTIVATION IN EUROPE.—This palm is pretty for stove decoration, when young.

LIVISTONA AUSTRALIS, Mart. Hist. Nat. Palm. III. 241; Wendl. and Drude in Linnæa XXXIX. 232; Bot. Magaz. t. 6274.—*L. inermis*, Wendl. and Drude, l. c. 229.—*Corypha australis*, R. Br. Fl. Nov. Holl. 26 f; Spreng. Syst. Veg. II, 138, No. 2; Roem. Schult. Syst. Veg. VII, 2, p. 1313, No. 11.

NAMES.—Australian Cabbage Palm. 'Kondo' of the aborigines in Australia.

DESCRIPTION.—Stem 40-80 feet high, cylindrical, slender, red-brown, annulate. Leaves in a dense oblong crown; petiole spreading and decurved, spinous on the margins; blade 3-4 feet in diameter, orbicular, cut to about the middle into 30-50 radiating slender bifid lobes, the acuminate points of which do not droop. Spathes 6-10 inches long, lanceolate, compressed, acuminate, rigidly leathery, tomentose. Spadix 3-4 feet long, decurved, much paniculately branched, the branches and branchlets curved and slender, quite glabrous, rachis compressed. Flowers minute, $\frac{1}{8}$ inch in diameter, spiked upon the very slender, terminal branchlets, green. Calyx of 3 short very broad, obtuse segments. Corolla of 3 triangular-ovate, fleshy, coriaceous, valvate, subacute petals. Stamens 6; filaments very broad and short; anthers subglobose. Pistillode 3 cleft. Fruit globose, $\frac{3}{4}$ inch in diameter; pericarp thick, crustaceous, granular outside with a smooth buff, obscurely veined inner surface; remains of stigma evanescent. Seed globose, testa pale brown, smooth; chalaza a brown, subterminal, large, polished areole; albumen very hard, white, not ruminant, with a broad, sack-like canal passing from the chalaza to the centre, and full of corky brown tissue; embryo dorsal above the base.

GERMINATION.—In the beginning the embryo becomes longer and grows thicker at the base in consequence of the plumule developing in the interior of the cotyledonal sheath. The axis of the plumule does not coincide with that of the embryo, as it passes laterally through the cotyledonal slit. The embryo has the shape of a cupule.

The first leaf is reduced to a sheath, the second shows the limb spread out.

At the base of the first root some lateral roots are developed which are thin and caducous. Gatin observed in a fourteen months' old plant the formation of a new lateral root, which was stronger than the first and destined, in the course of time, to exercise the function of the principal root.

HABITAT.—The most southern palm of the Australian continent, reaching the snowy range in lat. $37^{\circ} 30'$ S, when its stem attains 80 feet in height, and extending thence along the west coast to the Illawarra River, in lat. $34^{\circ} 45'$ S.

ECONOMIC USES.—The aborigines of Australia are very fond of the growing centre or heart of this tree, which they eat in a raw or cooked state. But Mueller says that the value of this esculent was not known to them in their uncivilized state.

Leichhardt mentions in his 'Overland Expedition to Port Essington' that the tops of the palm eat well, either baked in hot ashes or raw. Though very indigestible they do not prove injurious to health when eaten in small quantities, but 'several of my companions,' continues the same author, 'suffered by eating too much of the Cabbage-palm.'

The wood, or outer part of the stem is moderately hard and of a light colour. It is occasionally used for walking sticks, slabs for buildings, or the trunks are hollowed out for pig troughs. The central portion of the stem, when young and fresh, is said to be eaten by pigs.

The leaves are used for baskets. The unexpanded fronds prepared by being immersed in boiling water, are dried, and the fibre thus obtained is much valued for the manufacture of hats, which much resemble the celebrated Panama hats.¹

CULTIVATION IN EUROPE.—On the islands of Hyères in the Mediterranean Sea (not far from Toulon) this palm may be seen growing in the open, but suffers a good deal from the strong wind.

It is one of the best known palms for room cultivation and for the temperate house. It does not suffer from the dry air of the room and is very little subject to the change of temperature. In summer it may be kept in the open. In the hot house it attains a considerable size within short time.

The large rounded leaves are of a beautiful dark green with a metallic lustre. The leaf stalks, when getting old, assume a magnificent brownish red colour. The strong lateral spines of the petiole are almost black and as hard as iron.

Up to 1845 the only way of introducing palms from tropical countries into the hot houses of Europe was by means of young plants. This was not only troublesome and expensive but very

¹ Maiden, J. H. *The useful Native Plants of Australia*, London, 1889, p. 40, 563, 626.

often unsuccessful. A lucky chance lead to the discovery that the seeds of palms retain their power of germination for a long time.

Allan Cunningham, the famous botanical explorer, wanted to send some cases of plants from Port Jackson to Kew. When packing the specimens he told the servants to be careful as to the drainage of the lower part of the cases. The men, not having at hand for this purpose either potsherds or pebbles, made use of the round hard fruits of *Livistona australis*, covering with them the floor of the cases. In due time the cases were delivered at Kew, and Mr. Smith, the Curator of the Gardens, was so anxious to see the specimens sent by Cunningham that he personally supervised the unpacking of the cases. He saw the black seeds and noticed at the same time that the white delicate tip of the embryo had already broken through the hard shell. The seeds were at once confided to suitable ground and all the young palms developed rapidly.

From that time Mr. Smith instructed all the collectors in his employment to follow the simpler and safer way of enriching the palmhouses at Kew, *viz.*, by collecting and sending the seeds of the palms instead of young specimens.

HOW TO SEND SEEDS TO EUROPE.—The method first [adopted by Smith and imitated very soon by all the travellers has long since become the general practice amongst gardeners and botanists.

In order to secure good results, it is first of all necessary to dry the seeds well. They are then put into a case filled with bran, soil, and sawdust in order to prevent them from becoming dried up, because dryness is as harmful to them as moisture. If packed in this way, they germinate on the way and usually arrive in good condition. If they do not germinate, they begin to rot as is mostly the case with seeds that contain oil. The latter begins to become rancid and the seed loses its power of germination.

Syst. Veg. II, 137 ; Roem. Schult. Syst. Veg. VII, 2, p. 1306, No. 2 ; Poir. Encycl. Suppl. III, 482, No. 2 ; Mart. Hist. Nat. Palm. III. 239, t. 109, 110, 111 ; Wendl. & Drude in Linnæa XXXIX, 231. Benth. Fl. Austr. VII. 146.—*L. leichhardtii*, F. Muell. Fragm. VIII. 221.

DESCRIPTION.—Stems 4-15 feet high. Leaves orbicular-cordate in circumference when fully out, with a radius of about $1\frac{1}{2}$ foot, deeply divided into narrow plicate segments tapering to a fine point, the thread-like bristles between the lobes varying from nearly 1 inch to very minute, or altogether wanting ; petiole much flattened, the acute edges more or less bordered by small prickles, said to be often intermixed with larger ones even as much as $\frac{1}{2}$ inch long. General panicle very large and loose, the partial ones between the sheathing bracts pyramidal and 8 inches to 1 foot long, twice or three times branched ; the ultimate branches or slender spikes $\frac{1}{2}$ -1 inch long in flower, often twice that in fruit. Flowers numerous, in little sessile clusters along the spikes. Inner perianth-segments scarcely 1 line long, the outer perianth about $\frac{1}{2}$ as long with short, broad, rather obtuse lobes. Berry ovoid-oblong, obtuse, 7-8 lines long, more or less contracted at the base. Seed oblong, somewhat flattened.

HABITAT.—Australia : Arnhem's Land, Albert River, M'Adam Range, Port Darwin, Port Essington, Liverpool River, Wood Island.

USES.—The wood, or the outer portion of the stem, is hard, and of a light colour. The inner portion is soft and useless.

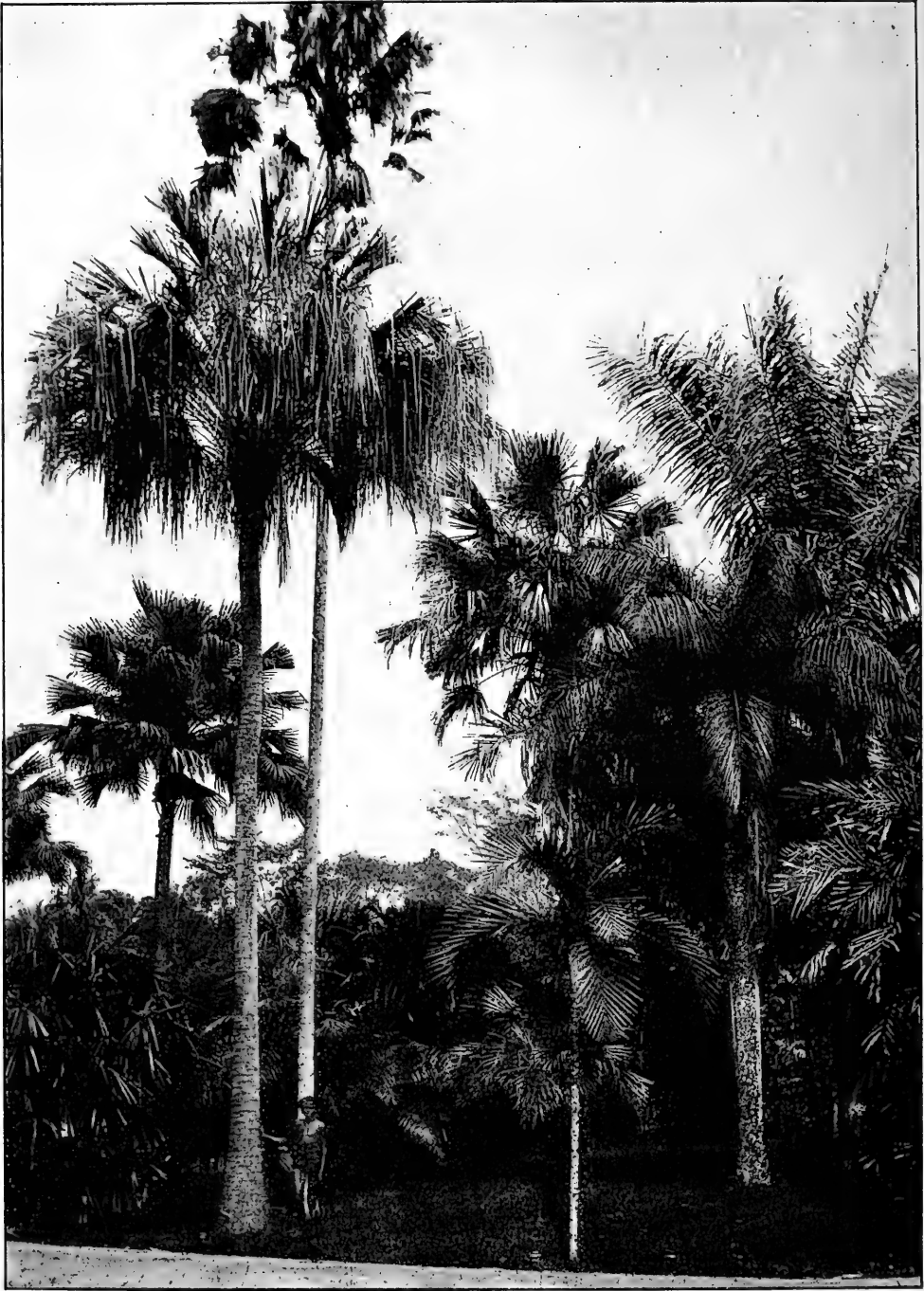
CULTIVATION IN EUROPE.—'This palm is a handsome species for decorative purposes, when young.

LIVISTONA INERMIS, R. Br. Prodr. 268.—Mart. Hist. Nat. Palm. III, 329, t. 145, 146.—Benth. Flora Austral. vol. 7, 146.

NAMES.—'Cabbage Palm' ; 'Partridge-wood.'

DESCRIPTION.—A moderate sized or tall palm, 14-40 feet high and 12-15 inches in diameter, with the ovoid-oblong fruits of *L. humilis*, but said to differ in the petioles entirely without prickles and the lobes of the outer perianth more acute.

Bentham has the following note on this species : " I have seen no specimen of this palm and Martius appears only to have known



From left: *Livistona chinensis*, R. Br. ; *Livistona inermis*, R. Br. ; *Livistona* sp. ; *Howea Forsteriana*, Becc. (in front) ; *Livistona olivæformis*, Mart. (at back) ; *Oreodoxa regia*, Mart. (in front) ; *Arenga Wightii*, Griff. (at back).

it from Bauer's drawings which he copied, the general habit being also represented in Flinder's Voyage in the view of Sir E. Bellew's Island, Vol. II, p. 172. It may prove to be a variety only of *L. humilis*."

HABITAT. Northern Australia.

USES.—The outer portion of the trunk of this tree is very hard, beautifully marked and takes a good polish. In colour, it is light-grey, streaked with a darker colour.

ILLUSTRATION.—Mr. Macmillan's photograph, reproduced on Plate XXVII shows a group of palms growing in the Royal Botanic Gardens of Peradeniya. Beginning from the left the picture contains the following trees:

1. *Livistona chinensis*, R. Br., of which only the crown and the upper part of the stem are visible.
2. *Livistona inermis*, R. Br., at the foot of which is standing a Singhalese coolie.
3. *Livistona* sp., the highest palm with torn leaves.
4. *Howea Forsteriana*, Becc., the slender but low palm quite in front with elegant pinnate leaves.
5. *Livistona olivæformis*, Mart., just behind *Howea*; the crown alone is visible.
6. *Oreodoxa regia*, Mart., to the right of *Howea*; the lichen-covered stem and the crown are visible.
7. *Arenga Wightii*, Griff., quite to the right; only the upper large leaves can be seen, which rise above *Oreodoxa*.

LIVISTONA OLIVÆFORMIS, Mart. Hist. Nat. Palm. III, 319.—Miq. Anal. Ind. II, 5; Flora Nederl. Ind. III, 59.—*Saribus olivæformis*, Hassk. Tijdschr. Nat. Gesch. IX, 176.

NAME.—Sadang Palm.

DESCRIPTION.—A tree, 15-20 feet high. Leaves palmate-flabelliform; petiole 5-6 feet long, semiterete, glabrous, with recurved spines at the base, for the rest unarmed, with a whitish tomentum on the underside when young; lamina usually $4\frac{1}{2}$ -5 feet long, consisting of about 90 segments; segments deeply bifid; laciniae linear, long-acuminate, pendulous, glabrous on both sides. Spadix

1-3 feet long, paniculate ; primary branches alternate, 5-6, $1\frac{1}{2}$ feet long ; branches and branchlets terete, glabrous. Flowers fasciculate, ternate or quaternate. Calyx trifold, corolla tripartite, both persistent. Drupe sessile, oblong-ellipsoidal (olive-shaped), slightly constricted at the base, scar of style sub-depressed, $6-7\frac{1}{2}$ lines long, $3\frac{1}{2}$ lines broad, violaceous-green ; putamen thin, fragile ; albumen white.

HABITAT.—Java.

LIVISTONA HOOGENDORPII, Teijsm. ex Teijsm. & Binn. Cat. Hort. Bog. 71.—André, Illustr. Hortic. vol. 21 (1874), p. 108, 121, t. 174.—*Saribus Hoogendorpii*, Zoll.

NAME.—Hoogendorp's Livistona.

DESCRIPTION.—Stem high, erect, showing triangular scars after the fall of the petioles. Leaves rich dark green, fan-shaped, suborbicular, $5-6\frac{2}{3}$ feet in diameter, divided into 10-12 lobes of which each has 5-7 sub-divisions, plicate at the base, linear acute at the apex, slightly furfuraceous like the uppermost part of the petiole. Petioles stout, triangular at the base, enclosed in a network of reddish brown fibres, and trigonous, rounded on the dorsal side, furrowed on the sides, $3\frac{1}{2}-5\frac{1}{2}$ feet long, reddish brown at the base, passing into olive green ; lateral spines in two rows, very stout, reflexed, $1\frac{1}{2}-2\frac{1}{2}$ inches distant from each other, towards the upper part of the petiole smaller and closer together, tubercled at the base, sharp pointed, $\frac{4}{5}-1\frac{1}{5}$ inch long.

HABITAT.—Indian Archipelago.

CULTIVATION IN EUROPE.—Hoogendorp's Livistona was introduced in Europe in 1846. It is a very ornamental plant for the hothouse.

ILLUSTRATION.—Plate XXVIII, reproduced after a photograph of Mr. Macmillan, shows a young specimen of *Livistona Hoogendorpii* growing in the Royal Botanic Gardens of Peradeniya.

The stem proper is not visible, being covered by the stout bases of the leaf-stalks. The latter are distinctly armed with strong slightly reflexed spines.



HOOGENDORP'S LIVISTONA (*Livistona Hoogendorpii*, Tejasm.).

PRITCHARDIA, Seem. et H. Wendl. in Bonpland, IX, 260 ; X, 197, 310, t. 15.

(After George Pritchard who explored the islands of the Pacific Ocean.)

Benth. et Hook. f. Gen. Pl. III, 928.—Becc. Malesia III, 286 ; Webbia, II (1907), 200—Calpothrinax, Griseb. et Wendl. in Bot. Zeitg., 1879, 147.—Benth. et Hook. f. Gen. Pl. III, 927.—Drude in Engl. et Pr. Pflanzenf. II, 3 (1889), 33.

Stem erect, columnar, solitary, unarmed, with annular scars. Leaves terminal, large, flabellate, orbicular or more or less cuneate at the base, undivided in the central part, more or less deeply multifid on the periphery ; the segments more or less deeply bifid, with or without filaments between the divisions ; ligule short ; rachis more or less elongate. Spadix a doubly branched panicle ; spathe two or more, complete, imbricate, very large, coriaceous, tubular in the lower part, open on one side of the upper part. Flowers hermaphrodite, scattered or spirally arranged on the branchlets, solitary, sessile on a bracteate pulvinus ; bracteoles 0. Calyx tubular-campanulate, 3-denticulate. Corolla very much longer than the calyx with a short permanent tube and 3 valvate divisions. Stamens 6 ; filaments subulate, united at the base, dilate and forming an erect corona ; anthers linear, oblong, versatile. Ovary obovate or turbinate ; carpels 3, half-free, united into an elongate style with common punctiform stigma, with one basilar erect ovule. Fruit globular or ovoid, with the remnants of the styles and sterile carpels more or less apical ; pericarp thin, grumous or fibrous ; endocarp more or less woody, often easily separating from the pericarp. Seed globular, free and erect in the endocarp ; hilum small, basilar ; raphe lightly impressed, occupying a whole side of the seed ; albumen uniform, solid ; embryo opposite to the raphe above the base or towards the middle.

Species about 10.—Fiji and Sandwich Islands.—The species described below has been introduced in Indian Gardens.

CULTIVATION IN EUROPE.—Very ornamental stove palms. They grow best in a compost of two parts of peat and one of loam and

sand. A liberal supply of water is essential. Propagation is effected by seeds only.

PRITCHARDIA PACIFICA, Seem. and H. Wendl. in Bonpl. IX (1861) 260; X, 153, 310, t. 15.—Seem. Flora Vitiensis, 274, t. 79; in 'Correspond. relat. the Fiji Isl., p. 70.—*Corypha umbraculifera*, Forst. Pl. Escul. 49 et Prodr., p. 88 (*ex parte*) (non Linn.)

NAMES.—Viu, Sakiki, Niu Masei (in Viti); Biu (by the Tonguese).

DESCRIPTION.—The palm seldom obtains more than 30 feet in height. Stem smooth, straight and unarmed, at the base from 10-12 inches in diameter. The crown has a globular shape, and is composed of about 20 leaves. Petioles unarmed, 3 feet and more long and densely covered at the base with a mass of brown fibres. Blade of the leaf rounded at the base, fan-shaped, very large, and when young, as is the petiole, densely covered with whitish-brown down, which, however, as the leaf advances in age, gradually disappears. From the axils of the leaves arise flowers, enveloped in several very fibrous flaccid spathes, which rapidly decay and have quite a ragged appearance even before the flowers open. Spadix 3 feet long, stiff and very straight, flowers numerous, minute, hermaphrodite, of a brownish-yellow colour. Fruit perfectly round, about $\frac{1}{2}$ inch in diameter; when quite matured, it has exactly the colour of a black-heart cherry; the mesocarp has a slight astringent taste.

HABITAT.—Islands of the Pacific: Vanua Levu, Viti Levu, Tongan and Samoan Islands.

USES.—The leaves are made into fans, 'Iri masei' or 'Ai Viu,' which (at Seemann's time) were only allowed to be used by the chiefs, as those of the Talipot formerly were in Ceylon. The common people had to content themselves with fans made of *Pandanus caricosus*. "Hence, though there is not a village of importance without the Sakiki, or, as it is termed in the Samosoma dialect, which suppresses the letter k, Saii, there are never more than one or two solitary specimens to be met with in any place, the demand for the leaves being so limited, that they prove



Pritchardia pacifica, Seem. et H. Wendl.

sufficient for the supply. The fans are from two to three feet across and have a border made of a flexible wood. They serve as a protection both from the sun and rain; during a shower of rain the fan is laid almost horizontally on the head, the water being allowed to run down behind the back of the bearer. The leaves are never employed as thatch, though their texture would seem to recommend them for that purpose; the trunk, however, is occasionally used for ridge-beams." (Seemann.)

CULTIVATION IN EUROPE.—Of all the palms introduced in Europe there is none that could rival as regards ornamental effect with this magnificent palm. It was discovered by Seemann on the Fiji Island and some other isles of the Pacific Ocean.

The regular globular silhouette of the crown of leaves borne on a straight erect stem gives the tree a very fine appearance. In the European hothouses the large leaves with long unarmed stalks are at once distinguished amongst the leaves of other palms. The gigantic fans are sometimes 5 feet broad and 4 feet long. Whilst young the leaves are covered with a tawny down which disappears very soon. The imported seeds germinate rapidly.

ILLUSTRATION.—We reproduce on Plate XXIX the photograph of *Pritchardia pacifica*, kindly supplied by Major Gage. The specimen represented is growing in the Royal Botanic Gardens of Sibpur, Calcutta.

WASHINGTONIA, H. Wendl. Bot. Zeit. XXXVII, 68 (1879).

The genus is dedicated to George Washington.

Benth. & Hook. Gen. Pl. III, 923; *Pritchardia* subg. *Washingtonia*, Drude, Engl. und Prantl. Pflanzenf. II, pt. III, 35 (in part) (1889); Baillon, Hist. Pl. XIII, 319 (in part).

Trees, with stout columnar endogenous trunks covered below with thick pale rind and above with the persistent sheaths of many dead leaves, long tough roots and a broad terminal crown of erect, then spreading, and ultimately pendulous leaves. Leaves induplicate in vernation, alternate, flabellate, orbicular, divided

nearly to the middle into many narrow deeply two-cleft recurved segments, separating on the margins into numerous slender pale fibres, long-petiolate; those of the first year linear-lanceolate; rhachises short, slightly rounded on the back, gradually contracted from a broad base, their margins concave, and furnished below with narrow erect wings, slender and acute above. Ligules oblong, elongated, thin, broad and conspicuously laciniate at the apex. Petioles broad and thin, plano-convex or slightly concave on the upper side, rounded on the lower, armed irregularly with broad thin large and small, straight and hooked spines confluent into a thin bright orange-coloured cartilaginous margin, gradually enlarged at the base into the thick elongated broad concave light bright chestnut-brown vaginas composed of a network of thin strong fibres. Spadix interfoliar, paniculate, elongated, pedunculate, glabrous, its numerous branches flexuose and pendulous; spathes numerous, narrow, elongated, glabrous. Flowers minute, white, articulate on thickened disk-like pedicels in the axils of ovate acute scarious bracts, slender and acuminate before anthesis. Calyx tubular, indurate at the base, gradually enlarged and slightly 3-lobed at the apex, scarious, persistent under the fruit, the lobes retuse, scarious, erose, imbricated in æstivation. Corolla funnel-shaped, the fleshy tube included in the calyx, half as long as the lanceolate acute striate lobes, thickened and glandular on the inner surface at the base, reflexed, imbricated in æstivation, deciduous. Stamens 6, inserted on the throat of the corolla; filaments of the stamens opposite the lobes of the petals consolidated with them for nearly $\frac{1}{3}$ their length and much thicker than the free filaments opposite the sinuses; anthers linear-oblong, attached on the back, versatile, pale yellow, 2-celled, the cells spreading below, opening longitudinally. Ovary superior sessile on a thick disc, depressed—obovoid, 3-lobed, 3-celled, crowned by an elongated flexuose exerted white horny style stigmatic at the apex; ovule solitary in each cell, lateral, erect, anatropous. Fruit baccate, small, ellipsoidal, 1-celled, 1-seeded, short-stalked, crowned with the remnants of the abortive carpels and of the style; pericarp of 2 coats, the outer thin, dry, black, and fleshy, the inner membranaceous, dark orange-coloured, lustrous on the inner surface. Seed free, erect,

oblong-ovate, convex above the base flat, depressed in the centre, marked by the minute sublateral hilum and the broad conspicuous raphe; micropyle lateral, minute; testa thin, light chestnut-brown, closely investing the uniform horny albumen; embryo minute, lateral, the radicle turned towards the base of the fruit.

SPECIES.—3 or 4.

DISTRIBUTION.—California; ? Arizona.

Botanists have been at variance for a long time as to the number of species belonging to this genus. Some admitted 3, others 2 and many considered it necessary to reduce all of them to one species. Beccari is of opinion that two species, well characterized, but both very variable, can be distinguished. In order to facilitate the correct identification of the specimens grown in Indian gardens we shall give a complete description of the species and varieties as published by Beccari (in Vol. II of the 'Webbia,' p. 187-200), adding *W. gracilis*, Parish, as a distinct species.

CULTIVATION IN EUROPE.—The species of *Washingtonia* are ornamental greenhouse plants. They are easily cultivated in a compost of rich strong loam to which is added a small portion of vegetable mould and sand. Good drainage and ample supply of water throughout the summer are necessary.

WASHINGTONIA FILIFERA, H. Wendl. in Bot. Zeitg. vol. 37, (1879), p. 68¹.—Sargent, Forest Trees N. Am. 10th Census U. S. IX, 217

(¹) It might not be out of place to consider the question why we adopt the specific name "filifera" of H. Wendl. instead of "filamentosa" of O. Kuntze. "Wendland's original species was published as *W. filifera*; but in his Revisio, Kuntze (1891) proposed to change it to *W. filamentosa* on the ground of priority, citing in support *Brahea filamentosa* Wendl. in Cat. Haage & Schmidt (1875), *Pritchardia filamentosa* Wendl. ex Fenzl in Bull. Soc. Tosc. (April 1876). To seek in a tradesmen's catalogue for a pretext for displacing an established name, requires a lust for change almost amounting to a mania. But if an appeal to trade-lists is to be made, priority is against the change, for Haage and Schmidt offered *Brahea filamentosa* in their autumn catalogue of 1875, but in the spring of the same year Linden in his list had put the same plant on the market as *Pritchardia filifera* (Fenzl 1876). *Pritchardia filamentosa* of Fenzl's paper is a *nomen nudum*, being without a word of scientific description or any reference to a published species. As the proper specific name, *filamentosa*, has absolutely no standing." Parish.

(pro parte ?).—Sprenger in Bull. Tosc. Ort. XIV, 319, f. 37.—Beccari in Webbia, II, 187.—*W. filamentosa*, O. Kuntze, Rev. Gen. Pl. II, 737 (1891).—Sargent, Silva N. Am. X, 47, t. DIX (pro parte ?)—*Brahea dulcis*, Cooper, Smithon. Rep. 1860, 342 (not Martius).—*Pritchardia filamentosa*, H. Wendl. in Bot. Zeitg. vol. 34, 807 (1876); Fenzi in Bull. Soc. Tosc. Ort. I, (1876) 116, cum icone xyl.—*Pritchardia filifera*, Linden, Ill. Hort. vol. 24, 105 (1877) cum ic. xyl.—*Brahea filamentosa*, Hort. ex S. Wats. in Proc. Am. Acad. XI. (1876), 147.—*Brahea filifera*, Hort. ex W. Wats. in Kew Bull. (1889) 296.—*Brahea robusta*, Hort. ex Salomon, Palmen (1887), 151.—*Corypha filifera*, Hort. ex Salomon, l.c. 151.—*Livistona filifera*, Makay and *Livistona ternatensis*, Hort. ex Salomon l.c. 174.

DESCRIPTION.—Stem rising to a height of 60-70 feet, slightly thickened near the base, where it measures $2\frac{1}{2}$ - $3\frac{1}{3}$ feet in diameter, then columnar and getting slightly thinner towards the apex, covered with the dead pendent leaves. Leaves large, measuring $5\frac{2}{3}$ feet from the apex of the petiole to the end of the central segments. Petiole about as long as the limb, dilated at the base into a coriaceous sheath which (in the centre of the crown) measures about 3 feet from its point of attachment to the point where the spines begin, more or less $1\frac{3}{5}$ inches broad at the apex and often $\frac{1}{2}$ inch only, much broader towards the base, plain above, convex below, in the leaves of old plants armed on the margins of the lower half with small spines which are deltoid, slightly or not at all uncinat, $\frac{1}{5}$ - $\frac{1}{3}$ inch long; for the rest the petiole is free of spines or shows a very small one here and there; ligule triangular, in shape and length like the rachis, with membranous dry margins; rachis triangular-elongate, twice or twice and a half times as long as broad, not counting the apical prolongation which projects into the limb. Limb divided to about the middle into about 80 segments, with long pale filaments between the segments and on the margins, equally green and glabrous on both surfaces; each segment deeply two-cleft and the two divisions arising thereof very acuminate and lacerate-filamentose at the extreme end; the central segments at the height of the deepest divisions are $1\frac{3}{5}$ - $1\frac{1}{3}$ inches broad, the outer segments become gradually narrower and shorter and more deeply divided, the outermost segments are only $\frac{2}{5}$ - $\frac{3}{5}$ inch broad and much shorter than the others. Spadices very large, arcuate-nutant, longer than the

leaves, with several large partial inflorescences rising from within the tubular primary spathes; these secondary inflorescences consist of several superposed branches, each of which forms a cupressiform partial panicle, $1\frac{1}{3}$ - $1\frac{2}{3}$ feet long, very dense, rising from the axil of a spathe; this spathe is tubular at first, but later on split lengthwise, laminar, longer than the respective panicle, $\frac{2}{5}$ -1 inch or more broad, truncate, shortly bidentate and ciliate-barbate at the apex. The partial panicles are doubly branched and divided into numerous filiform straw-coloured flowering branchlets which are $2\frac{1}{2}$ - $3\frac{1}{5}$ inches long. Flowers in bud lanceolate-acuminate, $\frac{1}{3}$ inch long and $\frac{1}{12}$ inch broad, obscurely angular; calyx tubular-campanulate, truncate at the base, lobes 3, divided to about the middle, broadly ovate, denticulate-crenulate, apex slightly furfuraceous-rubiginose; corolla twice as long as the calyx, tubular in the lower fifth, segments lanceolate-acuminate, subaristate, callous-papillose at the point of insertion of the respective stamen, spreading during anthesis in that part which is not surrounded by the calyx. The stamens opposite to the segments thickly fusiform, attached to the corolla with their lower third; the stamens alternating with the segments are terete, subulate, much thinner than the others, free almost to the base of the corolla; anthers lanceolate-sagittate, acute, shortly bifid at the apex. (Fig 20.)

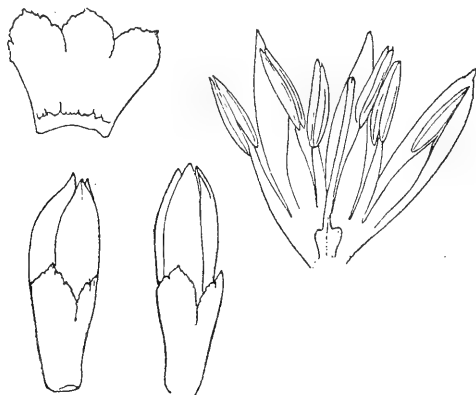


FIG. 20.—Flowers of *Washingtonia filifera*, Wendl.
× 3.5. (After Parish.)

Ovary small turbinate, 3-lobed, abruptly contracted into a filiform style. Stigma punctiform, non-lobate. Fruit ovoid, black,

shining, with fleshy mesocarp, usually $\frac{3}{8}$ inch long and $\frac{3}{8}$ inch broad, surmounted by the permanent, setiform, $\frac{1}{3}$ - $\frac{2}{8}$ inch long style. Seed ovate-ellipsoid, equally rounded at the two extremities, no incavation on the side of the raphe.

Sometimes two carpels are developed and in this case the fruits are a little asymmetrical.

HABITAT.—The exact locality of the original home of this species is still doubtful.

Parish, who made a special study of the history of this species, tries to give an answer to the question: "What precisely was the palm variously known to gardeners and seed-dealers as *Brahea filifera* or *Pritchardia filamentosa*, and to which Wendland gave the name *Washingtonia filifera*, and whence came it?"

"Wendland had before him a few young trees which had been grown in the palm houses of Linden in Ghent. It seems certain that the seeds were brought to Europe by Roezl. They purported to have been collected in Arizona, near the Colorado River, and Fenzl (1876) even gives latitude and longitude, which would locate the parent trees in the neighbourhood of Prescott, Arizona, a region rather of pines than of palms.

"It appears . . . that the only opportunity which Roezl had of procuring seeds of *Washingtonia* was during his visit to San Diego, in December 1869. The notes, however, contain no reference to this palm. But a visit to any of its desert habitats would certainly have been an experience far notable to have failed of record. Nor is it probable that his visit to San Diego, so short and so diligently occupied in collecting, could have afforded time for the difficult journey to the desert. The vague and confused habitat assigned to the palm is itself a sufficient evidence that the collector, from whom the information must have come, could never have visited a native grove. It is safe to conclude that the seeds he sent to Europe came from some of the older cultivated trees at San Diego, and that his pardonable ignorance of local geography prevented him from correctly understanding what was told him of the location of the indigenous groves."¹

¹ For further information cf. Parish S. B., Roezl and the type of *Washingtonia*, in Bot. Gaz. vol. 48 (1919), 462.

Specimens cultivated in Italy flowered towards the middle of August and fruited in November.

WASHINGTONIA FILIFERA VAR. *MICROSPERMA*, Becc.—Webbia, vol. II (1907), 191; Parish in Bot. Gaz., vol. 44 (1907), 420.

DESCRIPTION.—Stem as in the typical form. Leaves of adult specimens measuring 5 feet from the apex of the petiole to the extremity of the central segments. Petiole about as long as the limb, armed near the base with small dentiform deltoid, horizontal spines, for the rest unarmed, $1\frac{3}{5}$ -2 inches broad at the apex; rachis much more prolonged into the limb than in the typical form, being about 3-4 times longer than broad. Spadix $11\frac{1}{2}$ feet long with partial inflorescences, each about $6\frac{2}{3}$ feet long; the partial inflorescences composed of 6-7 cupressiform panicles, the lowest being the largest, measuring $1\frac{1}{3}$ - $1\frac{1}{2}$ feet in length and not differing in any way from those of the typical form; each panicle similarly provided with its spathe, which is broadly linear, $1\frac{3}{5}$ -2 inches broad and slightly longer than the respective panicle. Flowers white, with a strong disagreeable odour, in the bud oblanceolate acuminate, very little shorter than in the typical form, slightly attenuate at the base, at the broadest point (towards the upper third) $\frac{1}{12}$ - $\frac{1}{5}$ inch broad, not seldom slightly asymmetrical and sometimes more or less obtusely trigonous, calyx tubular-companulate, truncate at the base, divided down to the middle or beyond the upper third into 3 lobes; lobes broadly ovate or suborbicular, with the margins slightly imbricate. Corolla undivided and tubular in the lower fourth; petals lanceolate, acuminate-aristate, slightly concave or almost plain with the margins superposed or imbricate when in bud, delicately striate on the outer side, during anthesis horizontal, very strongly callous-glandular at the base behind the respective stamen. Stamens biseriate, but all of equal length, those opposite to the petals united with these in the lower third, stout, fusiform, subulate at the apex, those alternating with the petals free as far as the corolla is divided, thinner, terete, subulate and not inflexed at the apex, for the rest like the others, anthers about

$\frac{1}{8}$ inch long, narrowly lanceolate, acuminate at the apex but often very shortly bifid, and this occurs oftener in the stamens which are opposite to the petals. Carpels 3, very small, free at the base, forming a body slightly longer than $\frac{1}{24}$ inch; ovary turbinate, obtusely trigonous, trilobed and strongly gibbous above; the 3 carpels very abruptly contracted into one filiform trisulcate style with one punctiform undivided and not thickened stigma.

As to the 'undivided style' Beccari does not wish to assert more than what he saw when examining several flowers, and he does not exclude the possibility of the stigma opening into 3 lobes at a certain moment of the development of the flower.

Fruits ovoid, similar in every point to those of the typical form, but long and short diameter by $\frac{1}{24}$ inch smaller; seeds accordingly reduced.

HABITAT.—The original home of this variety is as little known as that of the type.

CULTIVATION IN EUROPE.—In 1874 Linden brought very young specimens to Florence. Since then they have been growing in different gardens in the vicinity of Florence and Viareggio and have produced flowers and fruits.

There is no doubt that the same variety is cultivated in many other establishments in Europe and probably also in India, but they have never been distinguished as such. It is quite possible that a closer examination of all the specimens now known under the specific name of *W. filifera* will disclose many other varieties, and if the number of varieties is increasing, botanists will probably find it convenient one day to reduce all of them to the old well established *W. filifera*, H. Wendl.

WASHINGTONIA ROBUSTA, H. Wendl. in Berl. Garten Zeit. II (1883), 198.—Rev. Hort. 1883, 206 et 1885, 401, f. 73.—Bull. Soc. Tosc. Ort., 1883, 117 et 1886, 301.—Orcutt in Bot. Gazette, IX (1885), 262.—Becc. Webbia, II (1907), 194.—*W. filifera*, (non Wendl.) S. Watson in Bot. Cal. II, 211, 485.—*Washingtonia filifera*, Wendl. var. *robusta*, Parish in Bot. Gaz., vol. 44 (1907), 420.

NAMES.—Desert Palm ; Fan Palm ; Palm Cañon.

The name ' Desert Palm ' had been given to the tree actually growing in the Colorado Desert of California, whilst the name of *Washingtonia filifera* was given to specimens growing in European gardens, which were supposed to have been imported from the same locality in California. Though, therefore, the scientific name of the Colorado plant has been changed, the popular name must, nevertheless, be retained.

DESCRIPTION.—Trunk stout, enlarged at the base, 60-90 feet high. Petioles stout and until old erect, $3\frac{1}{3}$ -5 feet long, 4-5 inches broad at the dark-brown base, and half as wide at the blade ; the upper surface concave, its thin, light-brown margins corneous and armed for their entire length with stout hooked spines, acuminate prolonged into the blade ; ligule papyraceous, acuminate, lacerate, $\frac{4}{5}$ -2 inches long ; blades $3\frac{1}{3}$ -5 feet in diameter, the 60-70 folds deciduously tomentulose on the lower edges, cleft two-thirds to the base, the margin of the divisions abundantly filiferous.

Spadices very large, longer than the leaves, nutant with 5-6 large pendent partial inflorescences, each bearing 2-5 separated thyrses, which are exceeded by their ligulate, chartaceous, spathoid bracts ; flowering branchlets usually $3\frac{3}{5}$ -4 inches long, $\frac{1}{24}$ inch in diameter, sinuose, glabrous, angular with the solitary flowers not very regularly inserted. Flowers, when in bud, $\frac{1}{24}$ inch long, $\frac{1}{16}$ inch broad. Calyx campanulate, truncate at the base, divided halfway down into 3 lobes, lobes more or less ovate, very irregularly ciliate-laciniate on the margin. Corolla much longer than the calyx, divided down to the lower fourth into 3 segments ; petals lanceolate, acuminate-subulate, rather strongly callosoglandular at the base. Stamens biseriate, but of equal length, as long as the petals, the three opposite the petals with the filaments very stout and subulate at the apex, tuberculate enlarged at the coherent base and abruptly subulate above ; the other three stamens terete ; anthers large, $\frac{1}{5}$ inch long, narrowly linear-sagittate, apparently acute or apiculate but in reality bifid at the apex for almost $\frac{1}{3}$ of their total length. Ovary turbinate at summit, truncato—rotundate, but neither

excavated nor gibbous; stigma bilabially 3-parted into 3 short lobes. (Fig. 21.)



FIG. 21.—Flowers of *Washingtonia robusta*, Wendl.
× 35 (After Parish).

The fruit ovoid, black, shining, with little fleshy mesocarp, about $\frac{2}{3}$ inch long, and $\frac{1}{3}$ inch broad, terminated by the permanent setiform style. Seed ovate, by $\frac{6}{24}$ – $\frac{7}{24}$ inch long and about $\frac{1}{5}$ inch broad, very slightly incavato-umbilicate on the side of the raphe.

The flowers are copiously nectariferous, and exhale a heavy odour, disagreeable when near by, but when diffused somewhat suggestive of the perfume of orange blossoms.

Beccari sustains the specific rank of this palm on the following three characters:—

- (a) The lobal filaments of the stamens tuberculately enlarged at the coherent base and abruptly subulate above.
- (b) The stigma bilabially 3-parted into 3 short lobes.
- (c) The ovary turbinate at the summit, but not excavated and not gibbous.

“The first two characters,” says Parish, “hold in the flowers of Californian trees which have been referred here, so far as concerns the few specimens I have examined. The ovarian character is less satisfactory.”

HABITAT.—Borders of the Colorado desert of Southern California, at low altitudes, seldom exceeding 1,100 feet.

"The distribution of the Desert Palm appears to have been determined by the boundaries of the great lake which, in the not very distant part, occupied the central depression of the Colorado Desert. We may reasonably suppose the shores of this ancient lake to have been enlivened, here and there, with groves of stately palms. A few venerable trees still linger near the upper shore line of this vanished sea, gaunt and ready to perish, and without offspring to succeed them; but the most have retired to the cañons of the surrounding mountains. Here they find congenial homes along the few and feeble streams, by some scanty spring, or narrow oasis moistened by alkaline percolations. The necessity of soil moisture is the governing factor in their distribution.

"The most extensive groves occupy a tract of strongly alkaline soil along the foothills some ten miles north of Indio, and extending some of the neighbouring washes. This belt may be considered the centre of distribution. The finest grove occupies, for a mile or more the narrow Palm Cañon, on the opposite side of the desert at the base of San Jacinto Mountain. Here hundreds of fine trees fill the sandy bed of the stream or cling to the rocky bases of its steep sides. The older trees are still vigorous, and there are abundant younger ones of all sizes.

"Most of the cañons at the desert bases of San Jacinto contain palms. A few grow in the cañon of the Whitewater, which is the western limit of the species. Its southern outpost is probably at Carrizo Creek; a few trees at Corn Springs mark its northern limit, and none are known east of Frink's Station."¹

DURATION OF LEAVES.—The functional life of a leaf is about one year. How long the dead leaves would remain attached to the trunk if undisturbed cannot be stated. Parish mentions a row of trees in San Bernardino over 30 feet high from which the leaves have never been removed, and the lowest are over 25 years old and still firmly attached to the trunk.

The thatch of dead leaves makes an admirable protection to the trunk from the scorching heat and drying winds of the desert. Unfortunately most trees have been deprived of this mantle. Its

¹ Parish S. B. A contribution toward a knowledge of the Genus *Washingtonia*, in Bot. Gaz., Vol. 44 (1907), 426.

inflammable material is easily kindled by an accidental fire, and is an almost irresistible temptation to the passing vandal; but the most destruction is attributed to the desert Indians, who are said to burn the dry leaves that they may more easily gather the fruit. To so burn them was the immemorial custom of the desert Indians and it has been erroneously alleged that in this they were influenced by a superstitious motive, *viz.*, the making of an offering by fire to the spirits of the dead. That any plants survive this ordeal of flames is strong evidence of the vitality of the species.

USES.—The wood of the Desert Palm is light and soft, and contains numerous conspicuous dark orange-coloured fibro-vascular bundles. The specific gravity of the absolutely dry wood is 0.5173, a cubic foot weighing 32.24 pounds. Trimble¹, while examining this Palm for tannin, was impressed by the sweet and salt taste of the fresh tissue. Less than one per cent. of tannin was found, but, as the specimen contained 68.97 per cent. of moisture, this raised the amount of tannin to 2.73 per cent. when calculated for absolutely dry substance. The quantity is too small, however, to give the tree any value on account of its astringency. Attention was then directed to the sugar content of the specimen with better results, for the amount found, when calculated for dry substance, was 15.50 per cent. Since this amount was not materially increased by first treating the infusion with acid, it was probably a glucose sugar. The ash in the absolutely dry specimen was found to be 11.86 per cent., over $\frac{1}{4}$ of which was sodium chloride, the actual amount of salt being 3.09 per cent. of the dry substance of the Palm. The specimen analyzed was a cross-section of the trunk at the base of the leaves.

The habitations of the desert Indians were mere shelters, but naturally palm leaves, when easily procured, were utilized in their primitive construction. Strands split from the leaves were convenient for tying, and it is said were sometimes used for the spiral coil with which they built up their baskets. They were also used in building the characteristic granaries used by these Indians for storing the various seeds used by them for food.

¹ Garden and Forest, Vol. IX., 133.

Of these food supplies the fruit of the palm was an important part. It was eaten fresh, and also dried for preservation. A favourite method of preparing the dried fruit was by tritulating it with water in a stone mortar until a pulpy mass, rich in saccharine properties was produced. The seeds were then separated and the pulp was thickened with meal made from pounded 'chia' (*Salvia*), or grass seed, or pine nuts. The bony seed itself was pounded into meal which Edward Palmer (1878), who seems to have tried it, pronounces "not inferior to cocoanut," a statement which may be accepted with some reservation. The terminal bud also was baked and eaten. Each grove was the property of a particular clan, to whom alone belonged the right to gather the fruit (Parish).

CULTIVATION.—The Desert Palm was first cultivated by the Jesuits in their mission gardens of southern California long before this region became a part of the United States. It has now become one of the commonest trees in the gardens and streets of the south-western part of California, growing rapidly and vigorously there, as it does in southern Europe, where, in a comparatively short time, it has attained a large size and produced flowers and fruits. Two specimens in San Pedro Street in Los Angeles, believed to have been planted by the Jesuit missionaries, with stems nearly 9 feet through at the ground, are estimated to be 100 feet high.¹

Wendland founded this species (1883) on young plants grown by Van Houtte at Ghent, and its ascribed indigenous source is evidently wrong, since it was asserted to be "the borders of the Sacramento River." Van Houtte received the seeds under the name of the species already known, and under that name their product was at first sold, until Wendland recognized them as distinct, and published the name *W. robusta*.

About this time collectors began to secure palm seed at Palm Springs, in the Colorado desert. Parish is convinced that this place was the true source of Wendlands second type, and he considers it as certain that most of the trees growing there are

¹ Kinney in *Scientif. American*, Vol. 60, p. 263.

identical with those now recognized in Europe as representing that species.

GERMINATION.—At the time of germination the cotyledonal petiole becomes slightly longer and then plumule and radicle develop at the same time. At the base of the primary root there arise some thin lateral roots and after some time it is covered with rootlets. The radicle remains for a long time the principal root, but after the development of several leaves, there arises a new lateral root which is much thicker than the primary root and destined to take its place in the course of time.

The first vegetative leaf is a mere sheath surrounded by the ligule of the cotyledonal sheath.

INSECT ENEMY.—According to Parish the Desert Palm is not known to be infested by any parasitic fungus, or to be subject to any bacterial infection. "Its sole enemy", he says, "is the larva of a Bostrychide beetle, *Dinapate Wrightii*, Horn, the only species of the genus. The female oviposits at the base of the living leaves, whence the larva bores downward through the trunk, its continually enlarging galleries becoming at length 18 mm. in diameter. These are tightly packed, for the most part, with rejected gnawings. The larval life of the insect is three or four years, perhaps even longer. The mature beetle has a length of fully 5 cm. and is the heaviest North American coleopter.

"The number of contemporaneous larvæ that might inhabit a single trunk has been estimated as high as 200 or 300; but Mr. W. G. Wright, who discovered the beetle, and who has assiduously investigated its habits, is of opinion that it would probably not exceed 50. But even such a horde of huge and voracious grubs, in their comparatively long life, might riddle a whole trunk with their galleries. They seem not to work any great destruction to the groves, however; in fact, the only evidences of their presence to the ordinary observer are the exit holes in dead trunks."

WASHINGTONIA GRACILIS, Parish in Bot. Gaz., vol. 44 (1907), 420

Washingtonia robusta, Hort. (in California, not of Wendland).

Washingtonia robusta var *gracilis*, Parish ex. Webbia II, 197.

DESCRIPTION.—Trunk slender, at least 65 feet high. Petioles, rather convex on the upper surface, $2\frac{1}{3}$ - $3\frac{1}{3}$ feet long, about 4 inches wide at the brown base and $\frac{1}{2}$ as wide at the blade, the corneous margins armed with short hooked yellow spines for the entire length, acuminate prolonged in the blade; ligule papyraceous, narrow, the margin entire; blade $2\frac{3}{4}$ - $3\frac{1}{2}$ feet in diameter, the folds 75-80, deciduously tomentose toward the base beneath, cleft little more than $\frac{1}{3}$ toward the base, not filiferous except for an occasional single filament in the sinuses of some of the folds.

Peduncles declined, exceeding the leaves; primary divisions 6-8, each bearing 5-10 separated thyrses, which are mostly exceeded by their narrow, deciduous, chartaceous bracts. Flowers nearly sessile. Calix tubular-campanulate, $\frac{1}{8}$ inch long, the short rounded lobes lacerate. Corolla-tube $\frac{1}{8}$ inch long, its lobes erect, narrowly lanceolate, $\frac{6}{24}$ - $\frac{7}{24}$ inch long. Filaments subulate, $\frac{1}{8}$ inch long; anthers versatile, $\frac{1}{8}$ inch long. (Fig. 22.)



FIG. 22.—Flower of *Washingtonia gracilis* Parish.

× 5 (After Parish)

Seeds broadly ovate, $\frac{6}{44}$ - $\frac{7}{44}$ inch long and $\frac{1}{5}$ inch broad, rugose on the side of the raphe.

This palm is readily distinguished from *W. filifera* and its varieties by its slender trunk and smaller and less deeply divided leaves, which are without filaments and on shorter petioles.

Beccari (l. c.) regards this palm as a variety of *W. robusta*.

It seems to me, however, that Parish is right when he says: "It would be possible, although in my opinion undesirable, to regard all the *Washingtonias* as varieties of a single polymorphous species, but the one now under consideration (*viz.*, *W. gracilis*) would of all be the least capable of such comprehension. Without question floral characters are of greater diagnostic value than those drawn from foliage or habit; but when the latter are of marked distinction, and apparently constant, they cannot be refused great weight."¹

HABITAT.—Probably indigenous in northern Lower California (Parish).

(Parish's description is taken from cultivated trees growing in San Bernardino and Riverside California.)

WASHINGTONIA SONORÆ, Watson, Proc. Am. Acad. XXIV (1889) 79; XXV (1890), 136; Parish in Bot. Gaz., vol. 44 (1907), 422.

Washingtonia sonora, Hort. in Webbia II (1907), 198.

NAMES.—*Palma Blanca*, *Palma Colorada*, *Palma Nigra* (in the Cape region of California).

DESCRIPTION.—Stem about 25 feet high, 1 foot in diameter. Leaves glaucous, filiferous, 3-4 feet in diameter, borne on comparatively slender petioles beset on the margins with variously curved spines, connected by a web of floccose hairs. The spadix is shorter, more slender, and more sparingly branched, and the perianth is thinner and more scarious than those of *W. filifera*.

This species is still very imperfectly known. Parish says that it is easily separable from the others by the obtuse juncture of the petiole with the blade. The leaves of the young plants he was able to examine were very abundantly filiferous.

Beccari had not had an opportunity of examining flowers of *W. sonoreæ*, and he regards it as a doubtful species, which may be a variety of *W. robusta*, suspecting that the obtusely triangular insertion of the petiole in the leaf blade may not prove a constant character.

¹ Parish, S. B., The Flowers of *Washingtonia*, in Bot. Gaz., vol. 46 (1908), 145.

Parish, in the meantime had an opportunity of examining a few flowers taken from the type specimen of this species, collected by W. Palmer at Guyamas, Mexico. The flower has the characters assigned to *W. filifera* so far as the filaments are concerned, the character of *W. robusta* as to the divided tip of the stigma, and the markedly lobate ovary of *W. gracilis*. (Fig. 23).

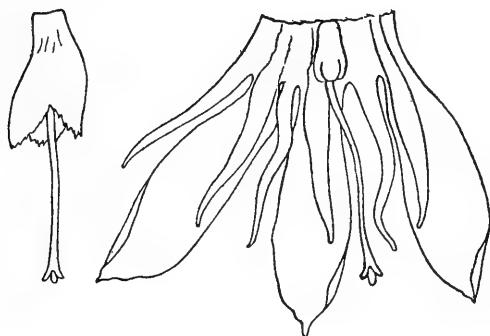


FIG. 23.—Flower of *Washingtonia sonora*, S. Watson.

× 5 (After Parish.)

It must not be forgotten, however, that these characters are drawn from a study of a few individuals only.

HABITAT.—First collected by Dr. Edward Palmer in 1887 “in secluded cañons in the mountains about Guyamas” (Watson); “in great quantities, and of great size, in the deep cañons running into the Gulf of California, far away from Guyamas” (E. Palmer); La Paz, in Lower California, and on the opposite side of the gulf (collected in these localities by E. Palmer and identified as *W. sonora* by Watson).

“The natives of the Cape region,” says Parish, “recognize three distinct forms of *W. sonora*. Two of these “Palma Blanca” and “Palma Colorada”—are distinguished by the white or red colour of the woody fibre of their trunks. The third—“Palma Nigra”—is said to be the smaller tree, growing at higher altitudes, where winter snows are not infrequent.”¹

¹ For more detailed information on the genus and species of *Washingtonia* we refer to the extensive ‘bibliography’ on this subject by S. B. Parish in Bot. Gaz., vol. 44, 1907, p. 431—434.

SABAL, ADANS. FAM. NAT. II, 495.

("Sabal" is said to be a native name in South America; but Adanson who originated the genus, gives no explanation.)

Mart. Hist. Nat. Palm. III, 245. et 319 (excl. *S. serrulata*), t. 103, 130.—Benth. et Hook. Gen. Pl. III, 922.—Drude in Engl. n. Prantl, Pflanzenf. I, 37,—Baill. Hist. des Pl. XIII, 313.—Sargent, Silva N. Am. X, 37.—Beccari, Webbia II (1907), 10.—Sabal et Inodes, O. F. Cook in Bull. Torrey Bot. Club, 1901, 529.

Unarmed trees or shrubs, with columnar and often stout or short annulated endogenous stems ascending while young from a subterranean thickened descending clavate caudex, clothed above for many years with the remnants of the sheathing bases of the petioles of the fallen leaves, and below with light red-brown rind, and long stout tough roots, which ultimately often form a great densely matted ball at the base of a short underground stem. Leaves terminal, induplicate in vernation, alternate, flabellate, orbicular, or cuneate at the base, tough and coriaceous, divided from the apex deeply or slightly into many narrow two-parted long-pointed segments plicately folded at the base, inserted obliquely on the sides of the rhachis, often filamentose on the thickened margins, with narrow midribs prominent below, and numerous slender straight veins; rhachises on the lower surface rounded and broadly winged toward the base, nearly flat and wingless towards the apex, and gradually narrowed to above the middle of the blade of the leaf, thin and acute on the upper surface; ligulas adnate to the rhachises, short or elongated, acute, concave, with thin incurved entire margins; petioles rounded on the back, biconcave with a central ridge on the upper side toward the apex, their margins acute, unarmed, concave and enlarged at the base into elongated chestnut-brown lustrous vaginas of stout tough fibres, young leaves lanceolate to oblong-lanceolate, gradually narrowed into slender petioles, entire. Spadix axillary, pedunculate elongated, decompose, at first erect, its rhachis compressed and flattened horizontally; primary branches short and pendulous or,

decurved angled or compressed, bearing numerous slender densely flowered secondary branches in the axils of ovate apiculate scarious persistent bracts; spathes numerous, the outer acuminate, enclosing the spadix in the bud, persistent on its peduncle, becoming hard and woody at maturity; the second tubular, conspicuously veined, thick and firm in texture, and scarious oblique at the apex, prolonged on the lower side into a long narrow point, infolding the base of the rhachis, each branch with its short thin spathe and the node of the rhachis below it enclosed in a smaller although otherwise similar spathe. Flowers perfect, minute, glabrous, white or greenish white, solitary on the ultimate branches of the spadix bibracteolate, in the axils of minute ovate acute persistent bracts. Calyx tubular, truncate at the base, unequally three-lobed, the lobes slightly imbricated in æstivation, acute. Corolla deeply 3-lobed, narrowed at the base into a short tube, the lobes ovate-oblong, concave, acute, in the bud slightly imbricated below, valvate at the apex. Stamens 6, those opposite the petals rather longer than the others; filaments white, subulate, dilated at the base, united into a shallow cup adnate to the tube of the corolla; anthers ovate, acute, bright yellow, dorsifixed, introrse, 2-celled, the cells free and spreading at the base, opening longitudinally. Ovary superior, sessile, composed of 3 carpels, 3-celled, gradually narrowed into an elongated 3-lobed columnar style, truncate and stigmatic at the apex, becoming subbasilar on the fruit; ovule solitary in each cell, basilar, erect, semianatropous; micropyle superior, extrorse. Fruit small, baccate, or obovate and gradually narrowed below, black and rather lustrous, 1 or rarely 2-3-lobed, raised on a short stout stem adjacent to the remnants of the style; pericarp separable into 3 coats, the outer thin, sweet and fleshy, mesocarp dry and spongy, closely investing the membranaceous inner coat, lustrous on the inner surface. Seed depressed-globose, free, erect, marked on the side by the prominent micropyle, depressed near the minute basal light-coloured hilum by a shallow pit rugose on the margins; testa thin, light or dark chestnut-brown, and lustrous; raphe basilar, its branches obsolete; albumen uniform, horny, penetrated by a broad shallow basal cavity filled by the thickening of the testa. Embryo minute, lateral or subdorsal.

SPECIES.—About 20.

DISTRIBUTION.—Sabal is confined to the New World, where it is distributed from the Bermuda Islands and the south Atlantic and Gulf coasts of North America through the West Indies to Venezuela. The type has survived from the period when palm-trees abounded in North America and Europe, and traces of its ancestors have been found in the lower eocene of western Europe and in the lignitic formations of Colorado. During the lower miocene period a large Sabal-like tree inhabited Europe as far north as 55 degrees, and existed in Italy until the later miocene.¹

USES.—The large succulent leaf-buds of the arborescent species are cooked and eaten as a vegetable, although their removal kills the trees.

Coarse hats, mats, and baskets are manufactured from the leaves, which also afford durable thatch for the roofs of buildings.

Pieces of the spongy part of the stem are used as a substitute for scrubbing-brushes, and in the Southern United States brushes are made with the stout strong fibres of the sheaths of the leaf-stalks.

CULTIVATION IN EUROPE.—The species of Sabal are stove and greenhouse plants, or half-hardy. Most of them are highly ornamental and thrive well in a light loamy soil. Propagation is effected by means of seeds, and sometimes by suckers. These should be removed from the parent plant when about 1 foot long and, if they have no roots, must in the beginning be carefully nursed.

SABAL ADANSONI, Guersent in Bull. Soc. philomat. III, (1803) 206, t. 25.—Bot. Mag. t. 1434.—Mart. Hist. Nat. Palm. III, 246, 319, t. 103, f. 2 et tab. morph. S., f. 1, t. Y, f. 4, t. Z II, f. 2, 3, 4.—Pursh, Fl. Amer. Sept. I, 239.—Shecut Fl. Carolinaens. I, 383, No. 1.—Roem. et Schult. Syst. Veg. VII, 2, 1485.—H. B. Croom in Silliman Amer. Journ. XXVI (1834), 313.—Chapman, Flora of the South. Unit. Stat., 2nd ed., 438.—O. F. Cook in Bull. Torrey Bot. Club, 1902, 530.—Hasskarl in Retzia, I, 5.—Becc. Webbia II.

¹ Lesquereux, Rep. U. S. Geol. Surv. VII., 112. t. 11., f. 3, 3a, t. 12, f. 1 2.

Saporta Origine Paléontologique des Arbres, 118.

Zittel, Handb. Palaeontol. II, 372

(1907), 20.—*Sabal minor*, Pers. Enchir. I, 399.—Spreng. Syst. Veg. II, 137.—*Sabal pumila*, Ell. Sketch I, 430 (ex Ind. Kew.)—*Sabal minima*, Nott. in Ann. Journ. Sc. Ser. 1, V (1822), 293 (ex Ind. Kew.).—*Sabal caroliniana*, Hort. Paris. fide Schult. fil. ex Kunth En. III, 246.—(?) *Sabal taurina*, Lodd. Cat. 1849 ex Mart. Hist. Nat. Palm. III, 320.—Griseb. Fl. Brit. West Ind. 514.—O. F. Cook in Bull. Torrey Bot. Club, 1901, 530.—*Sabal glabra*, Sargent, Silva North Am. X, 38 in nota.—*Rhapis acaulis*, Willd. Spec. Pl. IV, 1093, No. 2.—Smith in Rees Cyclop. No. 2.—Ait. Hort., Kew. ed. 2, V, 474.—*Corypha minor*, Jacq. Hort. Vindob. III, 8, t. 8.—Murr. Syst. Veg. ed. 14, 984.—Lamark Encycl. II, 131.—*Corypha pumila* Walt. Flor. Carol. 119.—*Chamaerops glabra*, Mill. Gard. Dict. ed. 8, No. 2 (ex Ind. Kew.)—*Chamaerops acaulis*, Mich. Flor. Amer. II, 207 (ex Ind. Kew.).

NAMES.—Dwarf Sabal; Swamp Palmetto; Adanson's Sabal.

DESCRIPTION.—A stemless palm with a subterranean rhizome, producing a crown of few leaves. Petioles about as long as the limb and sometime shorter, convex on the underside, broadly channelled above near the base, slightly or not at all concave towards the apex; ligule subtriangular, often inequilateral obtuse or slightly acute; rhachis short, narrowly winged on the margins near the base, straight; limb $\frac{3}{4}$ orbicular or a little more than half-orbicular, divided into 20-30 and sometimes 35 segments; segments acuminate, rigid, entire or very shortly bifid, separated from each other in the central part of the limb for half their length or $\frac{2}{3}$ of the upper part, with a slender and fugaceous filament at the end of the primary sinus; central segments usually $1\frac{1}{2}$ - $2\frac{1}{6}$ feet long, sometimes even 3 feet, $\frac{4}{5}$ - $1\frac{2}{5}$ inches broad at the height of the sinuses and in well developed leaves even 2 inches. Spadix glabrous, erect, narrow, rigid, 2-5 feet long with 5-6, or also 10-12 branches, each one arising from within a spathe; axis of spadix $\frac{1}{5}$ - $\frac{3}{8}$ inch in diameter, subterete in the upper part and more or less compressed in the lower, surrounded by several long tubular spathes without branches; upper spathes tubular in the lower part, acute or acuminate in the upper; branches born on a peduncular part which is surrounded by its respective spathe; the largest partial inflorescences (branches) near the base usually 4-6 inches long; and divided into 8-15 simple branchlets; branchlets more or less angular, filiform $\frac{1}{36}$ - $\frac{1}{18}$ inch in diameter and usually 2- $3\frac{1}{2}$ inches long; sometimes the partial inflorescences are 10 inches

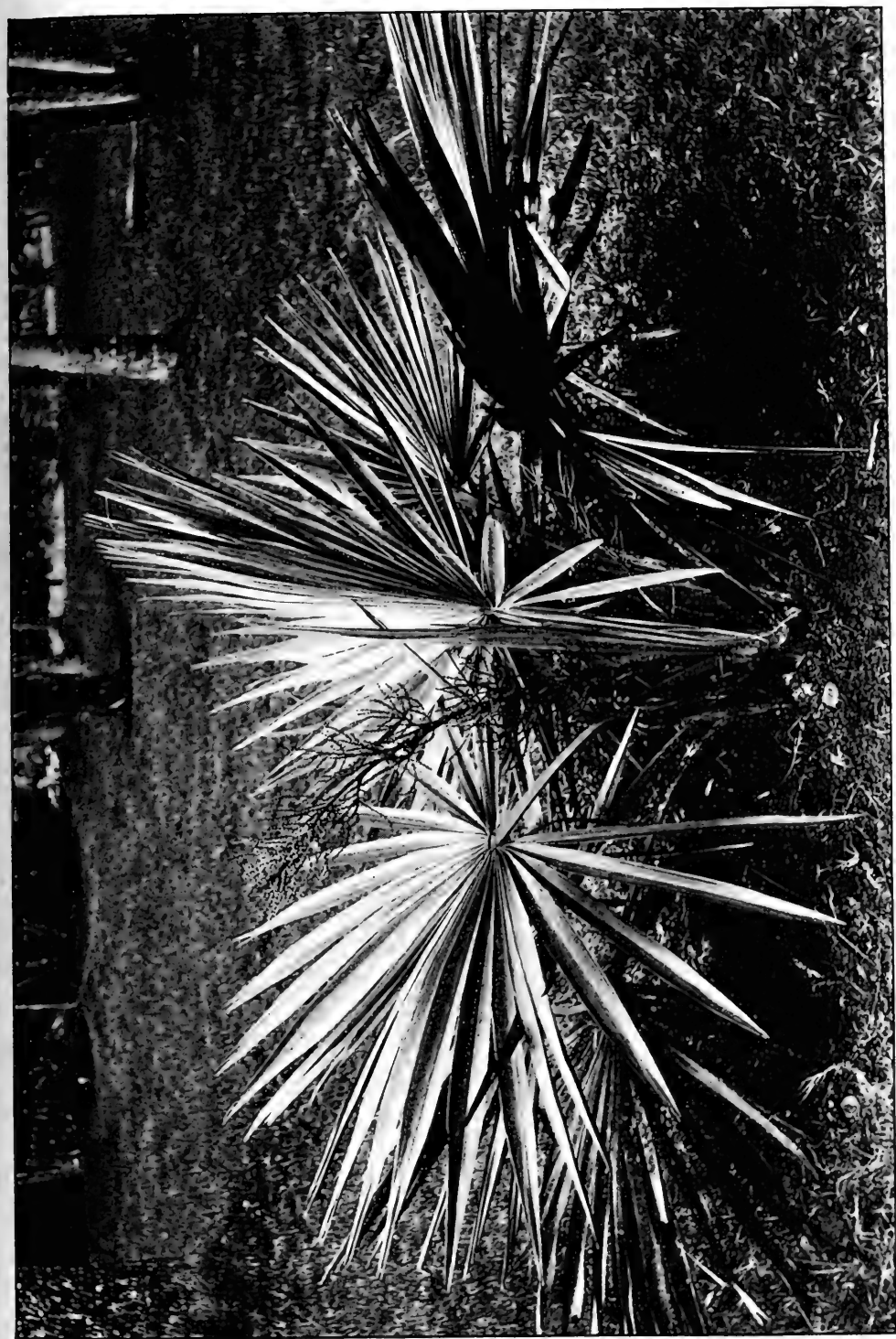
long bearing 25 and more branchlets of 4 inches in length and subdivided into shorter branchlets; the branchlets of the fruiting spadix are slightly stouter. Flowers inserted spirally and without great regularity on the branchlets, provided with a bract and a bracteole, both exceedingly small and apiculate, in a well developed bud measuring $\frac{1}{8}$ inch, oblong, more or less obtusely apiculate at the apex, when quite open $\frac{7}{16}$ - $\frac{1}{6}$ inch long; calyx cyathiform-campanulate, divided down to the middle into 3 broadly triangular or deltoid and slightly acute lobes; petals $1\frac{1}{2}$ times or twice as long as the calyx; petals united at the base into a short tube, ovate-ellipsoid, concave-cymbiform, slightly acute, not denticulate on the margins; stamens all equal, subulate; anthers small, very broadly cordate-sagittate, almost as broad as long. Ovary narrowly trigonous-pyramidal $\frac{1}{10}$ - $\frac{1}{9}$ inch long, 3-sulcate; stigma papillose, truncate-capitellate. Fruit supported by the perianth, perfectly spherical, showing the permanent style, when fully ripe $\frac{1}{3}$ - $\frac{3}{8}$ inch in diameter, black, shining; pericarp thin, pellicular; mesocarp very slightly fleshy, brown-violescent, slightly bitter. Seed globular, a little depressed, with shining surface, about $\frac{1}{4}$ inch in diameter; hilum eccentric; embryo situated towards the middle of one side or a little below it, penetrating horizontally into the albumen for about $\frac{1}{4}$ of the seed. Sometimes 2 seeds are developed and then the fruit is didymous; sometimes again one ovule is perfect and the other incompletely developed; in this case the fruit is more or less distinctly gibbous at the base.

HABITAT.—In the south-eastern part of the United States: from North Carolina southwards to Florida and westwards to Arkansas, Louisiana and Texas.

Grows in low and humid forests and inundated places, prefers sandy soil; occurs also on the seashore.

NOTE.—*Sabal Adansoni* is a very variable plant showing great adaptability to the various conditions of climate and soil. In this respect it resembles the Indian *Phoenix humilis*.

The polymorphism of the Swamp Palmetto can be observed especially in the vegetative parts and in the greater or smaller number of subdivisions of the partial inflorescences (branches)



DWARF SABAL (*Sabal Adansonii*, Guers.).



Beccari distinguishes 6 different forms; but it must be remembered that it is impossible to define them exactly, as all those forms are united by a great number of transition forms. It is, however, quite probable that a comprehensive study of this palm in its various localities will reveal the existence of well-defined subspecies in equally well-defined areas.

These are the forms mentioned by Beccari¹:—

- (a) Leaves large, erect; petioles as long as or longer than the limb. Spadices 3-plicate-ramose; last branchlets very short.
- (b) Leaves small or of middle size, patent; petioles much shorter than the limb. Spadices duplicate or sub-3-plicate-ramose; last branchlets very short.
- (c) Leaves large, erect; petioles long; spadices duplicate-ramose or simply branched.
- (d) Leaves small; spadices simply branched; branchlets rather short and rigid.
- (e) Leaves small; spadices simply branched; branchlets slender, filiform, elongate, usually not numerous.
- (f) Spadices simply branched; branchlets with smaller and more numerous flowers than usually.

CULTIVATION IN EUROPE.—The Dwarf Sabal is a greenhouse plant or even half-hardy. In the Mediterranean region it is very often cultivated in the open. Owing to its extraordinary power of adaptation the plant grows equally well in the climate of Calcutta, Peradeniya and Buitenzorg as in that of Florence and Collioure (43° 32' N. L.).

It is usually not held in very great esteem, because it grows slowly and produces few leaves. In open places which are exposed to strong wind the leaves become torn after a short time. It is, however, not without ornamental effect when grown together with underwood.

ILLUSTRATION.—Plate XXX was reproduced from an excellent photograph taken by Mr. Macmillan.

¹ Beccari, O. Le Palme americane della Tribù delle Coryphee, in Webbia vol. II, 1907, p. 27.

It represents a characteristic specimen of *Sabal Adansoni*, Guers.

The petioles channelled towards the¹ base, are about as long as the leaf-blade. The almost triangular ligule is distinctly visible on one of the left-hand leaves. Some of the segments are entire, but most of them are very shortly bifid. From between the leaves there rises a long spadix with about a dozen branches. In the upper part the flowers have just opened. The specimen is growing in the Royal Botanic Gardens of Peradeniya.

SABAL PALMETTO, Lodd. ex Roem. et Schult. Syst. Veg. VII, pt. 2, 1487, No. 5.—Mart. Hist. Nat. III, 247.—Dietrich Syn. II, 1201.—Kunth, Enum. III, 247.—Spach. Hist. Veg. XII, 107.—Chapman, Fl. South Unit. St. ed. 2a, 438.—Curtis, Rep. Geolog. Surv. N. Car. (1860), III, 64.—Sargent, For. Tr. N. Am. 10th Cens. U. S. IX, 217.—Nash in Bull. Torrey Bot. Club, XXIII, 99.—Beccari, Webbia, II, 32.—*Sabal umbraculifera*, Mart. Hist. Nat. Palm. III, 245, t. 130, et tab. morph. T, f. 5; t. Y, f. 5, 6, 7; t. Z, I (excl. syn. Glazeb. et local¹).—Griseb. Fl. West. Ind. Isl. 514.—*Inodes palmetto*, O. F. Cook in Bull. Torrey Bot. Club, 1901, 532.—*Corypha umbraculifera*, Jacq. Fragm. Bot. (1809) 7, No. 47.—*Corypha palmetto*, Walter, Fl. Carol. 119 (1788).—*Corypha glabra*, Mill. ex Salomon, Palmen, 150.—

¹. Beccari gives the following reasons for his identifying *Sabal umbraculifera*, Mart. with *Sabal palmetto*, Lodd. :—

"I have referred to *S. palmetto* the species of Martius *S. umbraculifera*, which this author founded on *Corypha umbraculifera*, Jacq. (non Linn.). Martius writes with reference to this palm that it was brought by Jacquin from his journey in America and that it flowered in the Garden of Schönbrunn. Jacquin, however, affirms that his *C. umbraculifera* came from Holland. Apart from this contradiction it is pretty sure that the description as well as the drawings of *S. umbraculifera* published by Martius were taken from the specimen which flowered at Schönbrunn. Of this specimen I have seen a part of the spadix in the herbarium of Berlin, corresponding in everything and in the minutest details of the flower with wild specimens of *S. palmetto*. Though Martius wrote that his *S. umbraculifera* grows in Cuba and Haiti, this statement must be considered as erroneous, because it was probably founded on the supposition that the palm described was brought from those regions by Jacquin. The specific name of *Palmetto*, Lodd. as recognized in Roem. et Schult. is certainly older than that of *umbraculifera*. Though we are not sure as to the exact date of the publication of that part of Martius' work in which that name occurs for the first time, Martius himself mentions on p. 247 *S. Palmetto* as one of those species of which he is not able to say exactly in which point they differ from his *S. umbraculifera*."



CABBAGE PALMETTO OR PALMETTO ROYAL (*Sabal palmetto*, Lodd.).

Chamaerops palmetto; Mich. Fl. Bor. Am. I, 206 (1803).—Willd. Spec. Pl. IV, pt. II, 1158.—Mchx. f. Hist. Arb. Am. II, 186, t. 10.—Pursh, Fl. Am. Sept. I, 240.—Nuttal, Gen. I, 231.—Elliot, Sk. I, 431.—Spreng. Syst. II, 137.—Croom, Am. Journ. Sc. XXVI, 315—London, Arb. Brit. IV 2532.

NAMES.—Cabbage Palmetto, Cabbage Tree, Pond Thatch, Pond Top.

DESCRIPTION.—A tree, with a trunk often 30-60 feet in height and 2 feet in diameter, broken by shallow irregular interrupted fissures into broad ridges, with a short pointed knob-like caudex surrounded by a dense mass of contorted roots, often 4 or 5 feet in diameter, and 5 or 6 feet deep, from which tough light orange-coloured roots, often nearly $\frac{1}{2}$ inch in diameter, covered with thick loose rind easily broken into narrow fibres, and furnished with short slender brittle rootlets, penetrate the soil for a distance of 15 or 20 feet, and crowned with a broad head of leaves which are at first upright, then spread nearly at right angles with the stem, and are finally pendulous. Leaves suborbicular with numerous segments (as many as 80 in cultivated specimens) measuring $4\frac{1}{3}$ - $4\frac{2}{3}$ feet from the apex of the petiole to the end of the central segment; petiole apparently a little longer than the limb, robust, at the apex $1\text{--}1\frac{2}{3}$ inches broad and plain or slightly concave above and convex below; ligule lanceolate or lanceolate-acuminate; rhachis stout winged at the base on both sides, curved and prolonged almost to the apex of the leaf. The central apical segments are much smaller than those in the middle of the sides. All the segments, included the outermost ones, are deeply bipartite, finely striated with numerous distinct secondary and tertiary nerves, of the same colour on both sides; primary and secondary sinuses provided with a distinct filament. Spadices forming large compound panicles as long as, or longer than, the leaves, nutant whilst in flower and curved-reflexed when in fruit; partial inflorescences forming secondary panicles of $1\text{--}1\frac{1}{3}$ feet in length, the upper ones even shorter, each one divided into 6-10 alternately distichous branches; spathes of the partial inflorescences narrowly sheathing, tubular-infundibuliform, brown and dry in the terminal part, very finely striate, entire and obliquely truncate where they open,

prolonged on one side into an acuminate point; branches of the artial inflorescences (inflorescences of the 3rd order) patent and arcuate in the lower part, 5-6 inches long, inserted within the respective spathe and each one having its own small tubular spathe which is dry, bicarinate on the axillary side, shortly bidentate or bicornute at the apex; branches angular and giving off 10-20 flower-bearing branchlets in a spiral arrangement; branchlets patent and slightly arcuate, simple, filiform, more or less angular, thin, $\frac{1}{24}$ - $\frac{3}{48}$ inch in diameter at the base, subulate, $2\frac{2}{5}$ -4 inches long, arising from the axil of a small broad scarious acute bract. Flowers arranged spirally and not very regularly, about 30-40 on each branchlet; at the base of each flower a large scarious acute and apiculate bract and a similar but smaller bracteole. Flowers in well developed bud about $\frac{1}{8}$ inch long and about $\frac{1}{12}$ inch broad, oblong, obtuse; when open $\frac{1}{5}$ inch long or slightly longer; calyx shortly companulate, divided almost to the middle into 3 large deltoid narrowly scarious and non-ciliate lobes; carolla more than twice as long as the calyx tubular in the lower $\frac{2}{5}$, concave-navicular; stamens as long as the petals; filaments subulate, anthers versatile, ovate-sagittate. Ovary including the style measuring about $\frac{1}{8}$ inch in length; style elongate, columnar, subtrigonus, slightly thicker at the base than in the upper part; stigma capitellate. Fruit perfectly spherical, $\frac{10}{24}$ - $\frac{11}{24}$ inch in diameter, black and lustrous with the remains of the style distinctly visible at the base; epicarp thin, fragile, easily separable from the mesocarp which is slightly fleshy; fruiting perianth shortly pedicelliform. Seed globose-depressed, regularly hemispherical in the upper part, $\frac{7}{24}$ inch broad, light bright chestnut coloured, flattened at the base and corrugate round the hilum, which is not very eccentric; micropyle very small; embryo situated about the middle of one side, deeply and obliquely penetrating into the albumen with the point directed downwards.

GERMINATION.—This process begins with the growth of the cotyledonal petiole, the radicular end of the embryo breaking through the seed coat. The radicle continues growing for some time, but the rate of growth becomes slower at the moment when

there appears a lateral emergence which increases rapidly in bulk, and from which, after some time, the plumule emerges. The primary root, producing a few rootlets, remains the only one for a long time. After this the cotyledonal ligule begins to swell and becomes longer towards the base. From this newly formed body (called stolon by Karsten¹) there arise adventitious roots which are below the primary root.

FLOWERS.—In June (in North America); fruit ripens late in the autumn.

HABITAT.—This palm inhabits sandy soil in the immediate neighbourhood of the coast, and is distributed from Smith's Island at the mouth of the Cape Fear River, North Carolina, to Key Largo, Florida (26° N. L.) and along the Gulf coast of the mouth of the Appalachicola River. Often forming groves of considerable extent on the Atlantic coast, it is most abundant and grows to its largest size on the west coast of the Florida Peninsula South of Cedar Keys.

“The survival of *Sabal palmetto*, with its tall columnar trunk and broad crown of foliage, the most boreal of existing palm trees in a region where the flora is northern in its predominating types, gives special interest to the coast of the south-eastern United States, where it is the most conspicuous feature of the vegetation.” (Sargent).

USES.—The wood of the Cabbage Palmetto is light, soft, and pale brown in colour, and contains numerous hard fibro-vascular bundles which make it difficult to work, the outer rim of the stem, about 2-inches in thickness, being much lighter and softer. The specific gravity of the absolutely dry wood is 0.4404, a cubic foot weighing 27.45 pounds. In the Southern States the trunks are used for wharf-piles; polished cross-sections of the stem sometimes serve for the tops of small tables, and the wood is largely manufactured into cases. From the sheaths of young leaves the bristles of scrubbing-brushes now often used in the United States are made in Florida in considerable quantities. To obtain the fibre used in the manufacture, 3-4 feet of the top of the tree, ‘the bud,’

Karsten. Ueber die Bewürzelung der Palmen. *Linnæa*, p. 601-608. Halle, 1856.

as it is technically called, consisting of the closely imbricating young leaf-stalks, is cut off and trimmed down to a diameter of about 8 inches. In this form the bud is received at the factory, where the soft edible core, consisting of the youngest leaves, is removed, leaving a cylinder with walls about 3 inches in thickness. This is boiled and shredded by machinery specially devised for the purpose, and when the fibre is dried, it is ready for the brush-maker. One factory in Jacksonville, Florida, used (1896) weekly 7,500 buds obtained chiefly from the west coast of the peninsula. As only young and healthy trees are used, and as the removal of the bud kills the tree, the industry is a wasteful and expensive one, destined to exterminate the Palmetto. Its existence is also threatened by the use for culinary purposes of the cabbage, or terminal bud, which is considered a great delicacy by the negroes of the Southern States of N. America.

Sleeping mats are made from the young leaves, and hats from the inner portion of the young leaves. They are said to be very cheap and durable. From the same material fancy baskets are made, also rope of the young leaves split and twisted.

HISTORICAL NOTE.—The Cabbage Palmetto has played an important part in the history of South Carolina. On June 28, 1776, a force of less than one hundred Carolinians, under command of Moultrie, protected by the rude fortification on Sullivan's Island in Charleston Harbour, made of the trunks of the Palmetto, repulsed the attack of a British fleet under command of Sir Peter Parker, and when the State of South Carolina was organized, the State seal, which was first used in May 1777, was made to commemorate this victory. A palm-tree growing erect on the seashore represents the strength of the fort, while at its base an oak-tree torn from the ground and deprived of its branches recalls the British fleet built of oak timber overcome by the Palmetto.¹

CULTIVATION.—It is remarkable that *Sabal palmetto*, which might be expected to be the hardiest of all arborescent palms, has remained comparatively rare in gardens. A plant has long been cultivated in the Palm House of the Royal Gardens at Kew and the

¹ John Drayton. Memoirs of the American Revolution, II, 372.

species is said to be established in Ceylon. In California, where nearly all the palms of temperate regions grow vigorously, it has not proved a success. It is cultivated in the gardens of Southern France and the Riviera where the tree is known under the names of *Sabal umbraculifera* and *Sabal Giesbreghtii*.

Beccari recommends the introduction and acclimatization of this palm in the vast barren marshes of southern Italy and Sicily, not only because the Cabbage Palmetto is propagated very easily, but also on account of its economic uses.

ILLUSTRATION.—The Cabbage Palmetto of Plate XXXI is growing at Peradeniya. We have to thank Mr. Macmillan for taking the photograph.

SABAL MAURITIEFORMIS, Gr. and Wendl. in Griseb. Fl. Brit. West. Ind. 514; Drude in Engl. und Prantl, Pflanzenf. I, 36, f. 27; Becc. in Webbia II (1907), 61.

Trithrinax mauritiaeformis, Karsten in Flora, vol. 28 (1856), 244 and in Fl. Columb. Sp. select. II, 137, t. CLXXII.

Sabal glaucescens, Lodd. ex Mart. Hist. Nat. Palm. III, 247 ? fide Griseb.

NAME.—Savannah Palm.

DESCRIPTION.—Trunk cylindric, columnar, distinctly annular-cicatricose (the rings 6 inches distant), 60-80 feet high, 12 inches in diameter. Leaves very large. Petiole long and comparatively slender, fugaceously furfuraceo-cinereous on the lower side, about $1\frac{1}{2}$ inches broad, much depressed, flat above in the upper part, slightly convex on the underside with the margins very acute. Ligule well developed, 2 inches long; rhachis considerably elongate and arcuate. Limb quite glabrous, measuring about $6\frac{2}{3}$ feet from the apex of the petiole to the end of the median segments, rigid-papyraceous, but thin, green above, distinctly paler and almost glaucescent below, divided into many broad laciniae down to almost the lower fifth; laciniae $2\frac{2}{5}$ - $2\frac{4}{5}$ inches broad, with their sides parallel or slightly divergent up to about $1\frac{1}{2}$ feet from the apex; here they are once more divided into two laciniae which in their turn about 8 inches higher up are divided into 2 very acuminate flaccid points; the limb, therefore, is three times divided and there are 3 sinuses; sometimes 2 primary segments are united with

each other up to the second sinus; at the lowest sinus there ends a secondary upper rib, at the second sinus the primary upper ribs and at the third sinus the primary lower ribs; the primary segments are consequently 3-costate. Spadices large, longer than the leaves, with various partial inflorescences $1\frac{1}{8}$ - $1\frac{1}{2}$ feet long and forming lax panicles. Secondary spathes tubular, striato-nervate, prolonged at the apex into a triangular acuminate point, entire at the mouth or scarcely split on the ventral side even when the fruits are ripe; each partial inflorescence consisting of 7-8 primary branches of which the lower are divided into 6-7 branchlets and the upper ones in 3-4; peduncular part of each branch provided with a special spathe exerted from the larger spathe and deeply divided into 2 points or subulate horns; branchlets very angular, filiform, $\frac{1}{24}$ - $\frac{1}{16}$ inch thick $2\frac{2}{5}$ - $2\frac{4}{5}$ inches long, with numerous flowers, each arising from the axil of a very small, triangular, acuminate bract.

Flowers in bud $\frac{1}{8}$ inch long, $\frac{1}{18}$ inch broad, oblong, slightly restricted and acutate towards the apex. Calyx cupular-cyathiform, divided beyond the middle into 3 triangular acuminate lobes; corolla thrice as long as the calyx, shortly tubular below. Ovary conico-pyramidal, elongate, marked with the irregular impressions of the stamens; stigma capitellate. Fruiting perianth with the calyx perfectly truncate at the base, petals deflexed, of the stamens the subulate filaments alone remain of which those opposite the petals are deflexed and the others erect.

Fruit globose-obpyriform, subresupinate, $\frac{1}{2}$ inch long, perfectly spherical at the apex where it measures $\frac{9}{24}$ - $\frac{10}{24}$ inch, attenuate into a somewhat asymmetrical base or incurved; style persistent, about $\frac{1}{12}$ inch long, curved below. Surface of fruit black, shining, indistinctly and minutely granular under the magnifying glass; pericarp finely crustaceous, fragile, dry; mesocarp almost reduced to nothing. Seed hemispherical, or with the upper part rotundate and the lower flattened-undulate; hilum very eccentric, almost lateral. Surface of seed blackish brown, minutely and not very distinctly granular under the magnifying glass. Embryo situated about the middle on the hilar side, obliquely and rather deeply descending.



To the left : SPINY LICUALA (*Licuala spinosa*, Wurm.).

In the centre : SAVANNAH PALM (*Sabal mauritiaeformis*, Gr. et Wendl.).

To the right : CHINESE LIVISTONA (*Livistona chinensis*, R. Br.).

HABITAT.—In the moist warm forests of the old Republic Columbia (Karsten); Trinidad (Grisebach); Venezuela (Bot. Gard. of Buitenzorg).

CULTIVATION IN EUROPE.—The Savannah Palm must be treated as a stove plant.

ILLUSTRATION.—Plate XXXII represents a group of palms from the Royal Botanic Gardens, Peradeniya. The photograph is by Mr. Macmillan.

To the left of the picture there is dense tuft of the Spiny Licuala (*Licuala spinosa*, Wurmbr.), which we described in the last number of this Journal on p. 81. The palm in the centre is the Savannah Palm (*Sabal mauritiæformis*, Gr. et. Wendl.), whilst on the right there is a small specimen of *Livistona chinensis* R. Br.

This palm may easily be distinguished by the following characters: The chief divisions of the leaves have got 3 ribs; the colour of the undersurface of the leaves is glaucescent; the fruits are very much narrowed at the base; the seed is provided with a central-rotundate tubercle and the hilum is considerably eccentric; three stamens of the fruiting perianth are erect and three reflexed; the corolla-lobes are acuminate and not nervose-costulate.

SABAL BLACKBURNIANA, Glazebrook in Loudon's Gardener's Mag. V (1829), 54, cum ic. xylogr.; Roem. & Schult. Syst. Veg. VII, 1488; Hemsley in Voy. Challenger, Botany I, 70, t. VI—IX (excl. syn. aliquibus) Becc. in Webbia II (1907), 54.—*Sabal palmetto* (non Roem. & Schult.) Rein in Bericht Senckenb. Naturforsch. Gesellsch., Frankfurt a. M. (1873) 150; J. Morris in Bull. Torrey Bot. Club (1885) 72.—*Sabal Adansoni* (non Guers.) A. H. Moore, List of Pl. collect. in Bermuda 1906, et exsiccata no 3142 (ex Becc. l. c.).—*Sabal Mocini* Hort., Riccobono in Boll. Soc. Ort. Palermo (1904) 32.—*Chamærops excelsa* and *Chamærops palmetto* Lefroy's List Bermuda Pl. (ex. Hemsl. l. c.).—*Chamærops glabra* Jones, Naturalist in Bermuda, 136 (ex. Hemsl. l. c.) *Inodes Blackburniana* O. F. Cook in Bull. Torrey Bot. Club (1901) 531.

NAME.—Bermuda Palm.

DESCRIPTION.—Trunk stout, straight, columnar, cylindrical, growing more than 40 feet high, $1\frac{1}{2}$ feet in diameter, annulate-cicatricose. Leaves of adult plant very large, suborbicular, with numerous

segments; petiole 8 feet long and up to $2\frac{2}{3}$ inches broad in the upper part, convex below, slightly concave above. Ligule up to 6 inches long, lanceolate, acuminate, with the margins involute. Rhachis prolonged to close the apex of the limb and strongly arcuate, with acute sides and winged in the lower part. Limb about as long as the petiole from the ligule to the apex of the central segments. The apical central segments much shorter and narrower than the outermost ones; all are long-ensiform and deeply bipartite; segments of the intermediate part of the sides 4 feet long and $1\frac{3}{5}$ inches broad at the height of the sinuses; the primary sinuses are at about the lower third and the secondary ones towards the middle, with a rather strong filament in each of them.

Spadices shorter than the petioles of the leaves, thrice branched, with rather dense partial inflorescences; secondary spathes tubular, narrowly infundibuliform, papyraceous-membranous, dry, comparatively short, $2\frac{1}{5}$ - $3\frac{1}{5}$ inches long, obliquely truncate at the mouth, where they are prolonged into a short, broad, triangular, acute or acuminate point, finely striate. Branches divided into various simple, flower-bearing branchlets; peduncular part short, much longer than the respective spathe, provided with its own tubular acutely bicarinate spathellule; branchlets arising from the axil of a short, broadly triangular, acute bract, flexuose, 4-6 inches long, angular, $\frac{1}{12}$ - $\frac{1}{8}$ inch thick at the base, gradually alternate-subulate towards the apex, not thickened when fruiting but with the pulvinuli bearing the fruits slightly tuberculiform. Flowers relatively large, $\frac{1}{5}$ inch long when in bud, oblong, rotundate above. Calyx cupular or shortly tubular, slightly contracted at the throat, with a broad and fleshy base, divided in the upper third into 3 broadly triangular lobes. Corolla a little more than thrice as long as the calyx. Stamens inserted a little below the middle of the corolla, relatively stout, subulate, very acute, acutely carinate along the median line towards the apex; anthers sagittate, ovate, acute. Ovary $\frac{1}{6}$ inch long, slightly attenuate-conical towards the apex; stigma capitellate.

Fruits* (comprising the perianth $\frac{4}{5}$ - $1\frac{1}{2}$ inch long and $\frac{2}{3}$ - $\frac{4}{5}$ inch broad, obpyriform, with the apex regularly rotundate, alternate to a rather acute and symmetrical base; fruiting perianth small,

reduced to the hardened calyx which is not accrescent; remains of style slender and straight; surface black; mesocarp fleshy, brown-violaceous, $\frac{1}{8}$ - $\frac{1}{6}$ inch thick; endocarp reduced to a very thin pellicle. Seed of the colour of roasted coffee, globose-depressed, $\frac{1}{24}$ - $\frac{1}{2}$ inch long and $\frac{1}{3}$ inch broad, with the base flattened and slightly concave; hilum almost central; embryo subdorsal, descending and penetrating beyond the middle of the albumen. Often 2 ovules are developed and in this case the fruit is perfectly didymous.

HABITAT.—Bermuda Islands.

USES.—Of the leaves of the Bermuda Palm hats, baskets, fans, etc., are made.

CULTIVATION IN EUROPE.—*Sabal Blackburniana* is one of the finest species of the genus and is very ornamental in open places where the tree is allowed to develop freely.

This species is easily distinguished by its large dimensions, by the spadix which is shorter than the petioles of the leaves, and by the large obpyriform fruits.

(To be continued.)

BOMBAY NATURAL HISTORY SOCIETY'S
MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION	.	...	...	No. 1.
LOCALITY	...	...	...	East Khandesh.
DATE	...	...	...	March-May 1911.
COLLECTED BY	...	...	...	Mr. C. A. Crump.

As this is the first report on the results of the Mammal Survey, a few words as to the reasons for, and objects of, the Survey will not be out of place.

In 1758, Linnæus published the tenth Edition of his "*Systema Naturæ*," which, later, was formally accepted by common consent as the Foundation Stone of Systematic Zoology. A great number, if not the larger proportion, of the animals included in that work had never been seen by its author, who described them from the writings of other naturalists, only accepting however such as had been figured.

The Linnæan "*Genera*" were almost as wide as what are now called "*Families*." For instance, *Simia* embraced all the monkeys from the African Chimpanzee to the American Marmoset, while the genus *Mus* included such widely different forms as the Guinea Pig, the Marmot, and the Flying Squirrel, as well as the Rats.

In proportion as communications improved and travelling became easier, more specimens reached European Museums, and zoologists came more and more to see the necessity for multiplying species, yet nevertheless, under the influence of the accepted theory of created species, it was not held to be an improbable thing that a "*species*" should co-exist in most widely separated parts of the world.

With the publication of Darwin's Theory of Evolution it was brought home to systematists, that further multiplication of genera and species was necessary.

Turning now specially to Indian Systemic Mammalogy, we find that during the middle third of the nineteenth century, quite a number of men were working at the subject on the spot. Horsfield

and Cantor in Malaya, Hodgson in Nepal, Hardwicke in what is now the United Provinces, Sykes in the Dekhan, Elliot in the Southern Mahratha Country, and Jerdon in Southern Madras were all collecting and, to a greater or less extent, working out their collections. Many others again, such as Hutton, Boys and Tytler were also collecting, while Blyth in India, Gray at the British Museum, and others were dealing with the material so collected. An immense advance was made in the classification of the Oriental Mammals and indeed all the obvious species were recognised, named and recorded. The work was all however on pre-Darwinian lines, *i.e.*, the written descriptions dealt, for the most part, only with salient characters and marked differences, very many of which are now known to be almost generic. Moreover, distances in those days were enormous and the distribution of literature slow, and each man worked separately, so that over and over again, in some cases the same animal, and commonly the same species of animal from different localities, was described and named by two or more workers.

In recent years it has been fully recognised that not only is it necessary to classify the "species," but that it is equally or even more important to systematically record geographical variations, which when sufficiently multiplied may, in the future, furnish data for the investigation of the problems of variation and distribution. To this end it is necessary to examine, compare and record not only well marked and striking differences, but even the most trivial, *provided such are fairly constant*.

It will be seen from what I have said above, that the work of the old systematists is useless to this end. Yet the necessarily strict rule of priority in nomenclature, without which the confusion of names would render systematic Zoology absolutely useless, makes it necessary that these old species should be all re-examined. The types on which many were based, have been completely lost, others are buried in Museums where reference to them is almost impossible, while the residue in the National Collection are either spirit specimens in which all colour characters have been lost, or skin and skull specimens which have been for various periods stuffed and exposed to the light, &c., until they are of but little more use

It is clear then, that if any advance in the systematic Mammalogy of India is to be made, not only series of specimens of each animal from each of a great number of different localities, in which the local conditions differ, are necessary but especially so from those localities, whence came the specimens to which names were given by the workers of the last century.

The only chance of obtaining such series of 'topotypes' is a systematic collection by an expert giving his whole time and intelligence to the work. The Bombay Natural History Society, recognising this, has organised a fund to meet the cost of a Mammal 'Survey' of India. Mr. G. C. Shortridge, who has already done good collecting work in Australia, Java, Borneo, &c., has recently left England to take part in this survey. While Mr. Crump, who was on the spot, has already begun work for the Society, the first fruits being the Collection from E. Khandesh with which this paper deals.

It is not expected nor intended that this survey shall cover the whole field of mammalogy in India. Its object, as I have tried to show, is to obtain a solid framework foundation of knowledge on which to build. The desirability of further collections by private individuals will not be lessened but increased, for we shall have obtained data which will enable us to deal with specimens so collected. The observations of Field Naturalists are quite useless, unless they can be associated with the exact name of the animal under observation. I am insisting on this point because several Members of the B. N. H. Society, of which I am myself a Life Member and also one of the earliest recruits, have expressed to me disapproval of the idea of the employment of paid Collectors, which they held would take from private individuals an interesting hobby, whereas if rightly regarded, it will add interest to their hobby. I trust that one result of this survey will be to bring in many recruits to the study of Mammals, and also additional members to our Society.

It has been suggested to me that the preparation and publication of provisional reports of the collections made will be waste of time and money. With this view I cannot agree. If, as I trust, a fair percentage of members come to take an interest in their

local mammalia, interim lists (even though provisional) should be useful to them not only as showing what forms have been obtained in any locality dealt with, but also what forms have *not been obtained*. Our Collector, I fear, will not be able to help much with vernacular names, habits or folklore; here residents can help enormously by ascertaining and recording such in the Journal, thus providing material for the Editor when Blanford's Mammalia comes to be revised.

In this and any of the following reports which it may fall to my lot to write, I propose, after careful study of the references, to discuss and deal with the synonymy given by Blanford in his Fauna, the first time any species comes to be considered, but shall not repeat this unless circumstances absolutely require it. Any undoubtedly new species or sub-species (geographical races) I propose to describe separately, if possible, in the same number of the Journal merely giving the name and a reference back in the "Report."

The area in which the present Collection was made lies along the border where the Khandesh District marches with the Nizam's Territory. (The Bats were taken at the Ajanta Caves actually within that Territory.) The boundary, for the most part, is a range of low ghats covered with scrub jungle, the plains above and below being mostly black alluvial soil, growing chiefly cotton and jowari, with occasional patches of babhul forest—noticeably at Ghodasgaum on the Purna River.

The collection is by no means completely representative, it consists of 152 specimens (including 10 in spirit) which I have been able to allot to 27 species in 23 genera.

The monkeys are represented by three specimens of the common Langur. There is no specimen of the common Red Monkey. Of Bats there are eight species mostly of quite common forms, which were dealt with in my paper "Some Konkan Bats." (Vol. XII, p. 716, 1899), one, however, *Taphozous kachhensis*, Dobson, has not, I believe, been recorded since it was first found by Stoliczka forty years ago.

The Insectivores are disappointing, being represented only by 3 Shrews. They are a most difficult group to classify and good

series of them are very badly wanted. Of the Tree Shrews (*Tupaia*) and the Hedgehogs there are no specimens. Amongst the Carnivores the Cats are represented by a fine series of what is generally known as *Felis chaus*, a name borrowed from a Caucasian species; the Viverridæ by 3 specimens of the Common Indian Mongoose and the Dogs by specimens of the Striped Hyæna, the Jackal and the Indian Fox, the two former seem to be Genera which vary but little in different localities while the last includes many species; Several other species of each of these 3 Sub-Families are no doubt obtainable in Khandesh. Rodents are more largely represented, but by no means so fully as one could wish, there being no specimens of several small forms which are quite common and widely spread. Among the specimens obtained are some specimens of a Hare which is so distinct a species that I have no hesitation in describing it. Two species were described nearly 100 years ago from "Bengal" and "Malabar" respectively. In 1867 Jerdon stated in his "Mammalia of India" that these two species (*ruficaudatus* and *nigricollis*) occupied the whole of India from the foot of the Himalayas to Ceylon (the former in the North and the latter in the South), the dividing line being the Rivers Tapti and Godavery. The present collection shows that this view is erroneous so far as the Khandesh Hare is concerned. Finally the Ungulates are represented by specimens of Blackbuck and Chinkara; there are no specimens of the Muntjac, Four-horned Deer, or Mouse Deer.

I trust I shall not be misunderstood in emphasising thus some of the lacunæ in this Collection, which I have done in the hope that some resident member may make them good.

I think the Society owes a debt of gratitude to Mr. W. S. Millard and Mr. N. B. Kinnear for the hard work which they have cheerfully put in, in collecting funds for and organising this "Survey." I wish to offer the Society and them my personal congratulations at the very promising results yielded by this the very first collection made, and my thanks for the privilege of being allowed to work out the specimens obtained.

The Collectors' notes, when given, will be found in square brackets at the end of the description of the species.

PRESBYTIS ENTELLUS, Dufr.

The Langur.

1797. *Simia entellus*, Dufresne. Bull. Soc. Phil., p. 49.
 1843. ? *Semnopithecus anchises*, Blyth. J. A. S. B. XIII, p. 470.
 1888. *Semnopithecus entellus*, Blanford. Mammalia No. 12.
 ♂ 40; ♀ 38, 39. Shendurni, E. Khandesh.

The National Collection is very badly off for specimens of this group. There is nothing which can with confidence be labelled *entellus*, a name based on a Bengal specimen. As however the species is stated to extend to Central India, the name must be used for the present. The forms named *anchises* and *leucopus* are from the Mysore table land and the Malabar Coast respectively, and until authentic representatives are available for examination, we must remain very much in the dark as to the number of distinct forms in this group.

LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

1810. *Megaderma lyra*, Geoffroy. Ann. Mus. XV., p. 190.
 1847. *Eucheira lyra*, Hodgson. J. A. S. B. XVI, p. 891. (Gen. nom. preoccupied.)
 1872. *Lyroderma lyra*, Peters. M. B. Akad. Berl., p. 195.
 1891. *Megaderma lyra*, Blanford. Mammalia No. 169.
 ♀ 135, 136. Ghodasgaum, E. Khandesh. in al. 134. Ghodasgaum, E. Khandesh.

In a paper on the Megaderms (A. M. N. H. XIX, 1907, p. 129) Dr. K. Anderson and myself established a sub-species *caurina*. From the material at our disposal we placed the boundary between true *lyra* and *lyra caurina* at longitude 75°-77°. The present specimens, which are undoubtedly true *lyra*, seem to have been taken right on this boundary line.

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Bat.

1852. *Scotophilus ceylonicus*, Kelaart. Prod. p. 22.
 1878. *Vesperugo indicus*, Dobson. Cat. Chir. B. M., p. 222.
 1891. *Vesperugo ceylonicus*, Blanford. Mammalia, No. 186.
 ♀ 77. Ajanta, Haidrabad Dekhan.

As recorded in my paper "Some Konkan Bats" (B. N. H. S. Journ. XII, p. 719, 1899) this species is quite common all down the West Coast from Surat to Kanara, and I have taken it at Poona. It is undoubtedly *indicus* Dobson, and it is quite possible that when series from Ceylon are available for comparison, Dobson's name will have to be used, *ceylonicus* being limited to the Ceylon form.

PIPISTRELLUS DORMERI, Dobs.

Dormer's Bat.

1875. *Scotozous dormeri*, Dobson. P. Z. S., p. 373.

1891. *Nycticejus dormeri*, Blanford. Mammalia No. 193.

♀ 55, 78, Ajanta in al. ♂ 57, 58. Haidarabad Dekhan.

The type came from Bellary. Mr. Thomas dealt with this species in his paper in our Journal (Vol. XI), 1897, and I gave some notes on it two years later in my paper "Some Konkan Bats" (Vol. XII, p. 718). Later still I found it quite common everywhere. Its resemblance to other pipistrelles no doubt caused it to be overlooked in earlier days.

PIPISTRELLUS MIMUS, Wroughton.

The Southern dwarf Pipistrelle.

1891. *Vesperugo abramius*, Blanford. Mammalia No. 187 (partim).

1899. *Pipistrellus minus*, Wroughton. Journ. B. N. H. S. Vol. XII, p. 722.

♂ 87 (in al.) . . . Bhodwad, E. Khandesh.

Hitherto only recorded from the Surat District. I have however taken it above Ghats in Khandesh, and at Poona and as far South as Kanara. It is probably widely distributed, but owing to its close resemblance to the common 'V. abramus' (Blanford No. 187) has been overlooked.

SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

1822. *Scotophilus kuhli*, Leach. Trans. Linn. Soc. XIII, p. 72.

1891. *Nycticejus kuhli*, Blanford. Mammalia No. 194 (partim).

♂ 74. Ajanta, Haidarabad Dekhan.

♂ 94. Bhodwad, E. Khandesh.

The type of *kuhli* is a quite young specimen of which the type locality is unknown. The synonymy in Blanford's "Mammalia" entirely disappears, thus:—

V. temmincki of Horsfield is a Javan animal of which the British Museum has a fine series, and *castaneus*, Hors. is Malayan. The remaining names represent bats which may be placed in 4 groups by the length of the forearm as follows (F. A. in *kuhli* is 62):—

1831. *S. heathi*. Horsfield, is the S. Indian form. F. A. 65 and over.

1834. *S. belangeri*, Is. Geoff. = 1851, *luteus*, Bl. = 1851, *flaveolus*, Horsf.
F. A. 58.

1897. *S. wroughtoni*, Thos. F. A. 50.

The two specimens sent differ very considerably in coloration, but until series are available, it is impossible to say how much of this variation is individual, sexual, seasonal or racial.

[I spent one day in the Ajanta Caves looking for bats. There appear to be only two species inhabiting these caves as per specimens obtained. Many thousands find a resting place here, and when alarmed utter shrill screams and a peculiar croaking noise. The sexes were not apart at this time, but as a rule I did not find both species in the same cave. There were no young.—C. A. C.]

SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

1897. *Scotophilus wroughtoni*, Thomas. B. N. H. S. Journ. XI. 2, p. 275,
♂ 83. Bhodwad, E. Khandesh.

The type specimen was taken by me in the Surat Dist. Later I obtained specimens on the Coast and Ghats as far south as the Satara Dist. and Mr. Coplestone, I. F. S., took it in Kanara, but this is the first specimen taken so far from the sea.

TAPHOZOUS MELANOPOGON, Temm.

The Black-bearded sheath-tailed Bat.

1841. *Taphozous melanopogon*, Temminck. Mon. Mamm. II., p. 287.
1841. *Taphozous bicolor*, Temminck. l. c., p. 290.
1891. *Taphozous melanopogon*, Blanford. Mammalia No. 218.
♂ 62, 63, 71, ♀ 61, 64, in al. 65, 66, 67. Ajanta Caves, Haidarabad Dekhan.

There is not a good collection of specimens of this species in the British Museum. Within our boundaries it is represented only by two or three isolated specimens, and a fine series taken by Mr. E. Comber in the Kennery Caves.

The type locality of *melanopogon* is the Bantam District in Java. Temminck, however, also described a species *bicolor* from Calcutta, but whether identical or not with the present specimens we need a series from the type locality to decide.

TAPHOZOUS KACHHENSIS, Dobs.

The Cutch sheath-tailed Bat.

1872. *Taphozous kachhensis*, Dobson. P. A. S. B., p. 152.
1891. *Taphozous kachhensis*, Blanford. Mammalia No. 221.
♂ 60, 73. ♀ 59, 70, 72, in al. 69, 75, 76. Ajanta Caves, Haidarabad Dekhan.

The British Museum possesses only one specimen of this bat, a spirit specimen, bleached quite white. While there is no doubt of the correctness of this specific identification of these specimens, it may well be that they are a distinct local race; this however cannot be decided until a topotype series of skin specimens is available for comparison.

PACHYURA SPP.

Shrews.

- ♂ 47. Shendurni, E. Khandesh.
 ♀ 53. Fardapur, Haidarabad Dekhan.
 ♀ 52. Fardapur, Haidarabad Dekhan.

In the present state of our knowledge of the Indian Shrews it is useless to try and assign names to stray specimens. I have given considerable study to the small amount of material available, and the only sure result I have obtained is that all individuals from the plains of India belong to the Genus *Pachyura*, while all Himalayan forms are *Crocidura*. In the present case the coloration of the 2 Fardapur specimens is identical, yet they, I believe, are undoubtedly different species, while No. 47 ♂ from Shendurni is the same species as No. 53 ♀ from Fardapur. This I gather from the proportions of the body and the size of the teeth.

FELIS AFFINIS, Gray.

The Jungle Cat.

1830. *Felis affinis*, Gray and Hardwicke. III, Ind. Zool. I., pl. 3.
 1832. *Felis kutas*, Pearson. J. A. S. B. I, p. 75.
 1836. *Felis (Lynx) erythrotus*, Hodgson. J. A. S. B. v, p. 233.
 1844. *Felis jacquemontii*, I. Geoffroi. Jacq. Voy., IV, p. 58.
 1888. *Felis chaus*, Blanford. Mammalia No. 41.
 ♀ 8. Jalgaum, E. Khandesh.
 ♀ 138. Ghodasgaum, E. Khandesh.
 ♂ 45, 49, ♀ 41. Shendurni, E. Khandesh.
 ♀ 68. Fardapur, E. Khandesh.
 ♂ 102, ♀ 95. Edalabad, E. Khandesh.

Local name—*Ran Billi*.

Felis chaus was described from the Caspian Sea. In 1898, Mr. de Winton studied this group of Cats and recognised 2 subspecies of *chaus*, viz., *nilotica* and *furax*, from Egypt and Palestine respectively, and *affinis* from India. The two former are at once distinguishable by their teeth, which are much larger and stouter than in true *chaus*. Mr. de Winton distinguishes *affinis* from typical *chaus* by "its rather longer tail, bright fox-red ears, and lighter build." He adds "The skull is narrower and the teeth are not nearly so heavy." I have measured the upper carnassial in a specimen from the Caucasus, and find it to be 15×7.5 .

In two specimens from Persia and Seistan these dimensions are practically the same, in a specimen from Gangutri, the type locality of *affinis*, these dimensions are 13×6 . In a series of skulls from the Punjab, Rajputana, Central India, Khandesh, Poona, Nepal, &c., I have not found one with a larger carnassial than this, while some are appreciably smaller. There can be no sort of doubt that the Indian form is quite distinct from

the typical *chaus*, from the Caspian Sea, and I cannot see any advantage in perpetuating the name *chaus* for the Indian form.

The type locality of *affinis* is Gangutri while the type of *jacquemontii* came from Kedernath,—Hodgson's *erythrotus* is the Nepal form, while *kutas* was described by Pearson from Midnapur.

Gangutri and Kedernath are so close to one another that we may fairly assume that *affinis* and *jacquemontii* are the same animal, most probably its range extends to the highlands of Nepal, and thus it is also identical with *erythrotus*. Whether the lowland Nepal form is different from *affinis*? and is or is not the same as *kutas* from *Midnapur*? and whether *kutas* represents the Madras form? or whether the last is again different? are questions which must be left to be solved, it is to be hoped, by the later collections of this Survey.

[SHENDURNI.—The Betel leaf is much grown here in gardens enclosed in walls of grass tatts frequently 15 ft. high. These gardens, which are almost incessantly watered by canals and frequently surrounded by plots of bananas, make excellent and cool cover for Cats and Jackals. I posted myself in a convenient spot and had excellent views of the Cats that were driven out, among which were specimens 41, 45 and 49. When being driven and so long as there is cover the Cat exhibits no haste or fear but moves with the utmost stealth and caution, a splendid example of the art of concealment. These Cats live on small birds, rats and also fowls which they will seize within sight of the owner, as a rule about sunset, and during the day they lie up in these gardens, in hedges or in trees. They will not leave their hiding place until compelled—C. A. C.]

MUNGOS MUNGO, Gmel.

The Common Indian Mongoose.

- 1788. *Viverra mungo*, Gmelin. Syst. Nat. I., p. 84.
- 1792. *Viverra nems*, Kerr. Anim. Kingd., p. 160.
- 1812. *Ichneumon edwardsi*, Geoffroy. Descr. Egypt, p. 139.
- 1812. *Ichneumon griseus*, Geoffroy. l. c.
- 1823. *Herpestes frederici*, Desmarest. Dict. Sc. Nat. XXIX, p. 69.
- 1829. *Herpestes malaccensis*, Fischer. Syn. Mamm., p. 164.
- 1836. *Mangusta (Herpestes) nyula*, Hodgson. J. A. S. B. V., p. 236.
- 1841. *Herpestes pallidus*, Wagner. Schreb. Saug. Supp. II., p. 311.
- 1888. *Herpestes mungo*, Blanford. Mammalia No. 60.
- ♀ 9. Parola, E. Khandesh.
- ♂ 36. Shendurni, E. Khandesh.
- ♂ 54. Fardapur, Ajunta, E. Khandesh.

The type locality of *mungo* is not expressly stated by Gmelin, but as the name is based on the Portuguese name of the animal, we may fairly accept the southern West Coast as such.

[SHENDURNI.—Here, as in the other parts of Khandesh that I have visited Mongooses appear to be by no means common. My experience of the Mongoose is that if he is about he will soon show himself running boldly in the open near native huts and round stacks. I enquired everywhere and the local men immediately offer to show me some but rarely succeed and express wonder that on that particular morning or evening no mongoose showed himself. Of course it might be that while I am watching one side of a wall or stack the Mongoose is on the other, but this is unlikely to be always the case. I have seen several in the neighbourhood and on some cultivated land about a mile from human habitation.—C. A. C.]

HYÆNA HYÆNA, L.

The Striped Hyæna.

1758. *Canis hyæna*, Linnæus. Syst. Nat. X., Edn., p. 40.
 1780. *Hyæna striata*, Zimmermann. Geog. Gesch. II., p. 256.
 1888. *Hyæna striata*, Blanford. Mammalia No. 66.
 ♂ 149, 153 ; ♀ 133. Ghodasgaum, E. Khandesh.

Local name—*Tarras*.

Mr. Thomas has recently pointed out (P. Z. S. 1911, p. 134) that *hyæna*, L., must be used for *striata*, Zimm. The type came from the Benna Mountains near Bunder Abbas in the Persian Gulf. In the absence of a topotype I have compared this series with specimens from Smyrna, Aden, and Somaliland, and can find no marked difference. Somali specimens do not seem to have the dorsal crest blackened to the same extent as the others. Indian specimens seem to have the teeth a trifle stouter.

CANIS AUREUS, L.

The Jackal.

1758. *Canis aureus*, Linnæus. Syst. Nat. X. Ed., p. 40.
 1833. *Canis aureus indicus*, Hodgson. As. Res. XVIII., p. 237.
 1888. *Canis aureus*, Blanford. Mammalia No. 69.
 ♀ 31. Bhadgaum, E. Khandesh.
 ♀ 37. Shendurni, E. Khandesh.
 ♂ 56. (imm.) Fardapur, E. Khandesh.
 ♂ 82. (no skull) Jamner, E. Khandesh.
 ♂ 155. ♀ 139. (no skull) Ghodasgaum, E. Khandesh.

Local name—*Koela*.

Linnæus' name was based on a description and picture by Koempfer of an animal he found on the Benna Mountains in the Province of Lar, S. Persia. The Society has only recently been able to obtain two good specimens from Bunder Abbas which may be taken as typical *aureus*. The present specimens are distinguishable from the typical by skull and tooth characters, but whether they are so from *indicus*, Hodgson, cannot be decided until Bengal specimens are available for comparison.

VULPES BENGALENSIS, Shaw.

The Indian Fox.

1800. *Canis bengalensis*, Shaw. Gen. Zool. I., p. 330.
 1831. *Canis kokree*, Sykes. P. Z. S., p. 101.
 1833. *Canis rufescens*, Gray and Hardwicke. III. Ind. Zool. II., p. 3.
 1833. *Canis (Vulpes) indicus*, Hodgson. As. Res. XVIII. pt. 2, p. 237.
 1837. *Vulpes hodgsonii*, Gray. Charl. Mag. N. H. 1, p. 578.
 1888. *Vulpes bengalensis*, Blanford. Mammalia No. 72.
 ♂ 32. ♀ 30. Bhadgaum, E. Khandesh.

Local name—*Koka*.

The present specimens undoubtedly represent *Canis kokree*, Sykes, whose type locality was “Dukhun,” but whether they are separable from *rufescens* and true *bengalensis* there is no sufficient material available to me on which to decide.

The first and last three synonyms, above, probably represent the same animal, unless the Fox of the United Provinces is different from that of Bengal in which case *rufescens* must be used for the former.

JALGAON.—I also put up a Fox, reddish in colour and with a very pronounced white tip to his tail, after consulting “Blanford” I presume this must have been *Vulpes leucopus*, it appeared larger than No. 30 which was collected later.

I met Mr. Jenkins (Police Superintendent) here (Fardapur), and he asserts that he has occasionally in Khandesh observed foxes with the tails tipped white which bears out my own observation.

[WADGAON AND BHADGAON.—On an isolated hill I trapped a fox and from the condition of the mammæ I judged she had just reared a litter of cubs, so the “earth” which had two openings was opened and found to be about 5 feet long, both passages leading to the nest; however, it contained no cubs, so I had a further look round and found another “earth” on the opposite side of the hill, I concluded this was the bore of the ♂ and perhaps where the cubs had hidden, so trapped and caught one cub. The “earth” had 6 outlets and several runs from 4 to 6 ft. long and all but one converging to a centre chamber, one run started from the centre and going straight for a few feet turned sharply into a hollowed out chamber. The earth was empty except for the remains of a hare.—C. A. C.]

FUNAMBULUS PENNANTI, Wrought.

The Common Five-striped Squirrel.

1891. *Sciurus palmarum*, Blanford. Mammalia No. 253 (part).
 1905. *Funambulus pennanti*, Wroughton. Journ., B. N. H. S., p. 411.
 ♂ 2, 3. Parola, E. Khandesh.
 ♀ 34, 35. Pachora, E. Khandesh.
 ♀ 46, (no skull). Shendurni, E. Khandesh.

♀ 92, 93. Bhodwad, E. Khandesh.

♂ 141, 145, 152, ♀ 143, 144. Ghodasgaum, E. Khandesh.

Local name—♂ *Kargoota*, ♀ *Kargooti*.

I obtained the type of this species in the Mandvi Taluka of Surat, and at the same time a specimen of *palmarum*. All the specimens now sent are typical *pennanti*, it seems that *palmarum*, the southern form, runs up further north in the Konkan than above Ghats.

[SHENDURNI.—Palm squirrels are plentiful everywhere and the specimen No. 46 had a nest composed of sticks and grass and lined with cotton hair and bits of rag. I was watching the movements of these squirrels one day and noticed that they drove all crows from the ground near their particular tree, but made no attack upon doves which were feeding along with the crows and moreover the doves made no attempt to move while this was going on.—C. A. C.]

TATERA INDICA, Hardw.

The Indian Gerbil.

1807. *Dipus indicus*, Hardwicke. Linn. Trans. VIII, p. 279.

1891. *Gerbillus indicus*, Blanford. Mammalia No. 264 (part).

1906. *Tatera indica*, Wroughton. A. M. N. H. XVII, p. 497.

♂ 1. Jalgaum, E. Khandesh.

♂ 4, 5, 6, 14, 16, 17, 20; ♀ 11, 12, 13, 15, 18, 21. Parola, E. Khandesh.

♂ 22, 29; ♀ 23, 24, 28. Bhadgaum, E. Khandesh.

♀ 44. Shendurni, E. Khandesh.

♂ 80 (imm.) Jamner, E. Khandesh.

♀ 88 (imm.) Bhodwad, E. Khandesh.

♂ 100, 101. Edalabad, E. Khandesh.

Local name—♂ *Undir*; ♀ *Undiri*.

The type locality of *indicus* is not exactly known but all Hardwicke's names are based mainly on specimens from the United Provinces. Blanford includes *cuvieri*, Waterhouse, in the synonymy of *indicus*, but it is a quite well marked distinct species, known only from the extreme south of Madras (Tinniveli, Madura) until quite recently, when the British Museum received specimens from Mr. G. S. Hardy, I.C.S., taken in the Ratnagiri District.

[Gerbilles, as specimens herewith, are very common here. The entrance to the burrow is as a rule very large and very distinct, paths perfectly straight, lead from one burrow to another and out towards the feeding grounds, these must be traversed a great many times every night for the grass is often completely away. The Bhils dig these rats out regarding them as an article of food and as the flesh is rather white and sweet smelling I have no doubt they are good eating. The burrows I dug out

were circular in design covering a space in diameter from 4 to 5 yards, the runs are in much the same plane as a rule about 12 or 18 inches below the surface, many terminating in store chambers but containing very little grain now. Mr. Simcox informs me that during the last famine the Bhils made a practice of opening up these store chambers for the sake of the grain stowed away.—C. A. C.]

EPIMYS RUFESCENS, Gray.

The Common Indian Rat.

1837. *Mus rufescens*, Gray. Charl. Mag. N. H. I., p. 585.

1891. *Mus rattus*, Blanford. Mammalia No. 272 (part).

♀ 19. Parola, E. Khandesh.

♂ 25, 27 (imm.) ♀ 26. Bhadgaum, E. Khandesh.

♂ 150; ♀ 106. Ghodasgaum, E. Khandesh.

Without protracted study of material, which at present is not available, it is impossible to sort out the synonymy given by Blanford under "*Mus rattus*." The earliest available name for Indian *rattus* however is *rufescens*. Gray, in his description, records that the tail is shorter than the head and body, a statement which was based on a stuffed specimen in the Indian House Museum; this type specimen is now in the National Collection and has been unstuffed and the tail is certainly *not* shorter than the head and body. There are specimens in the British Museum from the United Provinces, and I have taken others at Dharwar which agree quite fairly with the present series. The most convenient course, therefore, is to accept, *rufescens* provisionally as the name of the Indian form of *rattus*.

MUS MUSCULUS, L.

The Common House Mouse.

1766. *Mus musculus*. L. Syst. Nat. XII, p. 83.

1891. *Mus Musculus*, Blanford. Mammalia No. 282 (part).

♀, 7. Parola, E. Khandesh.

The present specimen is a rather young individual and comes undoubtedly of imported stock.

I have not gone into the synonymy given by Blanford which is extremely complicated; it will be time enough when we have some series of Indian forms to deal with.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny Mouse.

1832. *Mus platythrix*, Bennett. P. Z. S., p. 121.

1839. *Mus saxicola*, Elliot. Madr. Journ. L. & S. X., p. 215,

1854. *Mus spinulosus*, Blyth. J. A. S. B. XXIII., p. 734.

1891. *Mus platythrix*, Blanford. Mammalia No. 289.

♂ (imm.) 97; ♀ (no skull) 96. Edalabad, E. Khandesh.

Bennett's type specimen was collected by Col. Sykes in "Dukhun," probably at or near Poona, *savicola*, Elliot, from Dharwar, and *spinulosa*, Blyth, from Punjaub are probably separable forms. It is unfortunate the present specimens are such poor ones, a good series from Khandesh would have been of great value.

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

1837. *Leggada booduga*, Gray. Charl. Mag. N. H. I., p. 586.
 1839. *Mus lepidus*, Elliott. Madr. Mag. L. and S. X., p. 216.
 1851. *Mus terricolor*, Blyth. J. A. S. B. XX, p. 172.
 1852. *Mus fulvidiventris*, Blyth. J. A. S. B. XXI, p. 351.
 1852. *Mus albidiventris*, Blyth. l. c.
 1866. *Mus beavani*, Peters, P. Z. S., p. 559.
 1891. *Mus booduga*, Blanford. Mammalia No. 287.
 ♀ 48. Shendurni, E. Khandesh.
 ♀ 86, 90. Bodvad, E. Khandesh.
 ♂ 108, 147, 148; ♀ 103, 151. Ghodasgaum, E. Khandesh.

The type of *booduga* was taken by Elliot in Dharwar District and is certainly the same as *lepidus*, Elliot, *terricolor*, Blyth, came from the same locality and is also probably identical; *fulvidiventris*, Blyth, came from Trincomalee. I took some specimens at Ootacamund which seem to answer to Blyth's description, and which are, I think, a variety of *Mus musculus*; *albidiventris* and *beavani* came from Calcutta and Manbhoom respectively and are probably identical, but whether they are distinct from *booduga* or not, there is no sufficient evidence to decide. Pending receipt of topo-type series of *booduga* with which to compare them I rank them as *booduga*. The British Museum has a series of '*booduga*' from Ahmednagar collected by the Rev. Mr. Fairbank from which the present specimens do not seem to differ to any appreciable extent.

MILLARDIA MELTADA, Gray.

The Soft-furred Field Rat.

1837. *Golunda meltada*, Gray. Charl. Mag. N. H. I., p. 568.
 1839. *Mus mettada*, Elliot. Mad. Journ. L. and S. X p. 94 (no description).
 1839. *Mus lanuginosus*, Elliot. l. c. p. 212.
 1891. *Mus mettada*, Blanford. Mammalia, No. 290.
 1911. *Millardia meltada*, Thomas. Journ. Bom. N. H. S. XX, p. 990.
 ♂ juv. 85, ♀ juv. 89. Bhodvad, E. Khandesh.
 ♀ 104. Godasgaum, E. Khandesh.

In his original description, Gray gives the type locality as "Inhabitants Bombay," but in the same paper he also describes *Golunda ellioti*, and *Leggada booduga*, assigning to them the same type locality.

The use of Elliot's name and the fact that most of these names are based upon Kanarese words, shows clearly that the species were based on Elliot's specimens, and we may therefore confidently accept Elliot's statement that they all came from the "Mulnad," in Dharwar District. In Vol. XVII, 1907, I described in this Journal (p. 998) 2 species, *comberi* and *listoni* of this genus, from Nasik and Colaba respectively.

I have since been convinced that some of the Nasik specimens, which I then thought might be true *meltada*, are nothing of the sort, but are *comberi*. Both *comberi* and *listoni* have comparatively coarse, harsh hair, while true *meltada* has it very silky and soft.

Unfortunately only one of the specimens in this collection is adult, but it is enough to show that it belongs to the soft haired *meltada* group and not to the more harsh haired *comberi* from the adjoining district of Nasik. Specimens in the British Museum collected by the Rev. Mr. Fairbank at Ahmednagar show that in that District too, the *meltada* type is the representative of the genus.

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

1837. *Mus kok*, Gray. Charl. Mag. N. H. I., p. 585.
 1839. *Mus (Neotoma) providens*, Elliot. Madr. Journ. L. and S. X, p. 210.
 1891. *Nesocia bengalensis*, Blanford. Mammalia No. 295 (part).
 1908. *Gunomys kok*, Wroughton. Journ. B. N. H. S. XVIII, p. 747.
 ♂ 10. Parola, E. Khandesh.
 ♂ 111, 112 juv., 113 juv., 116, 117, 118, 119 juv., 120 juv., 123 juv., 124, 125, 126, 127, 128 juv., 129, 131 juv.
 ♀ 109, 110, 115, 121 juv., 122 juv., 130, 132 juv., Godasgaum, E. Khandesh.

Local name—*Mugair*.

The types of both *kok* and *providens* were taken by Elliot at or near Dharwar.

I dealt with this species in this journal quite recently (l. c. supra). This series seems to show no important variation from Ahmednagar specimens.

GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

1837. *Golunda ellioti*, Gray. Charl. Mag. N. H. I., p. 585.
 1839. *Mus golundi*, Elliot. Madr. Journ. L. and S. X., p. 94 (no description).
 1839. *Mus hirsutus*, Elliot. l. c. p. 213.
 1876. *Pelomys watsoni*, Blanford. P. A. S. B., X. p. 181.
 1891. *Golunda ellioti*, Blanford. Mammalia No. 299.
 ♀ 42. Shendurni, E. Khandesh.

♀ 79, Jamner, E. Khandesh.

♂ 84. Bhodvad, E. Khandesh.

♂ 146. Ghodasgaum, E. Khandesh.

Gray gives the type locality as "Bombay," but as I have pointed out under *M. meltada* there is no doubt that the type came from the Dharwar District and *golundi* and *hirsutus* of Elliot are true synonyms.

Mus myothrix of Hodgson of which the type is in the British Museum (a mutilated flat skin) will, when again found, probably prove to be a distinct species.

Pelomys watsoni, Blanford, is based on 2 specimens "from the southern extremity of the Khirthar range, about 50 miles north-west of Kotri." The British Museum possesses 2 skin specimens from the Habb Valley, when a series of topotypes are available it will probably be found that Blanford's name must be revived for the Sind form of *elliotti*. The British Museum has a specimen of *coffaeus* furnished by Kelaart himself which shows that the Ceylon form is distinct from *elliotti*; *newera* may or may not be the same as *coffaeus*, but it is certainly distinct from *elliotti*. The type localities of *coffaeus* and *newera* are Kandy District and Newara Eliya respectively.

HYSTRIX LEUCURA, Sykes.

The Indian Porcupine.

1831. *Hystrix leucurus*, Sykes. P. Z. S., p. 103.

1833. *Hystrix cristata indica*, Gray and Hardwicke. Ill. Ind. Zool. II. pl. 14.

1851. *Hystrix zeylonensis*, Blyth. J. A. S. B. XX, p. 171.

1865. *Hystrix malabarica*, Sclater. P. Z. S., p. 353.

1891. *Hystrix leucura*, Blanford. Mammalia No. 315.

♂ 104a, 105 (imm.), 107 (imm.). Ghodasgaum, E. Khandesh.

Local name—*Sail*.

Sykes described *leucura* from "Dukhun." Good adult skulls of the common porcupine are a great desideratum, but skins are not of great value.

[GHODASGAON.—I have done a good deal of tramping to find Porcupine's earths but find that all those anywhere near the village have been smoked out, this is done by a wandering tribe called Jinga Bhui. Damp grass is ignited and pushed as far in the hole as possible and the aperture then closed up till the Porcupines are suffocated when a man crawls in and fetches out the animals. There were none of this tribe near Ghodasgaon at this time and the Bhils would not do the work. Nearly all the Porcupines' earths I have seen have had four or five entrances, two or three openings being very large and the rest much smaller, a great quantity of earth is

thrown up and the entrances are frequently strewn with bones and dropped Sambur or Chital horns which are much gnawed by the Porcupines. In one case I found a Porcupine's hole in a perpendicular bank and in order to get to the upper level more easily the animals had dug a trench, the extraordinary part about it was that the channel had been dug so clean and square as to give the idea that spades had been used for the purpose, other pathways had been cut, but with less precision. I find Porcupines are easily taken in the ordinary Dorset or Gin traps but the traps I was using, being rather small, the full grown Porcupines always got away by either bending the trap jaws or by merely pulling the foot out leaving behind a toe and a good deal of skin which appears to slide easily from the foot; in one case the entire foot was left in the trap. Only well padded jaws will hold the young, the skin and bones are so soft that a toothed trap cuts right through. I found a path well trodden by Porcupines leading to the river so dug a pit near the water and watched for several nights. The moon was young and having seen nothing I had to return to camp about mid-night, only to find on the following mornings that Porcupines had been to drink water after I had left. Later on I sat up all night and found they came to the water about 3-30 to 4 a.m. but the moon having gone down they were very difficult to see. I could hear one rattling his quills and could just make him out with spines erect looking like a great prickly ball and surrounded by a family of young pigs. I tried a shot with surprising results for besides slaying the Porcupine I must have peppered several young pigs for with terrific squeals they rushed about cannoning violently into each other and with the old boar and sow, making no attempt at first to clear off. I did not feel particularly comfortable in my hollow 20 yards away. I have no doubt the Porcupine was responsible for some of the noise because I have since found that when hit he squeals very much like a pig. The Shikari here asserts that the hollow quills in the tail are used for carrying water to the young.—C. A. C.]

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

1912. *Lepus simcoxi*, Wroughton. Journal, B. N. H. S., supra p. 338.

♀ 51. Fardapur, E. Khandesh.

♂ 98 ; ♀ 99 (type). Edalabad, E. Khandesh.

♀ 142 ; ♂ 137. Ghodasgaum, E. Khandesh.

This Hare differs markedly in appearance from any other Indian Hare. The grey nape so different from the black of *nigricollis* and the fulvous of *ruficaudatus* catches the eye at once. The blue black scut too is in strong contrast to the brown of the other two species.

The type No. 99 has been presented to the National Collection.

ANTILOPE CERVICAPRA, L.

The Black-buck.

1766. *Capra cervicapra*, Linnæus. Syst. Nat., p. 96.
 1850. *Antilope bezoartica*, Gray. P. Z. S., p. 117.
 1891. *Antilope cervicapra*, Blanford. Mammalia No. 357.
 ♂ 91. Bhodwad, E. Khandesh.
 ♂ 104a. Ghodasgaum, E. Khandesh.

GAZELLA BENNETTII, Sykes.

The Indian Gazelle.

1831. *Antilope bennettii*, Sykes. P. Z. S., p. 104.
 1842. *Gazella christii*, Blyth. J. A. S. B. XI, p. 452.
 1844. *Antilope hazenna*, Is. Geoffroy. Jacq. Voy. Ind. IV., p. 74.
 1891. *Gazella bennettii*, Blanford. Mammalia No. 359.
 ♂ 81. Jamner, E. Khandesh.
 ♀ 43. Shendurni, E. Khandesh.

These specimens no doubt represent true *bennettii*; Blyth's *christii* came from Cutch or S. Sind and Geoffroy's *hazenna* from Malwa. Whether they are distinct forms I have no specimens on which to base an opinion.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN

"THE FAUNA OF BRITISH INDIA."

SERIES IV, PART III.

By

SIR GEORGE F. HAMPSON, BART., F.Z.S., F.E.S.

(Continued from page 1083 of Volume XX.)

Genus BRYOPHILA.

Type.

- Pæcilia*, Schrank, Fauna Boica ii (2), p. 157 (1802), nec.
 Bl. Sch. Pisces 1801 *muralis*.
Bryophila, Treit. Schmett. Eur. v (1), p. 57 (1825) .. *muralis*.
Metachrostis, Hübn. Verz., p. 204 (1827) .. *muralis*.
Euthales, Hübn. Verz., p. 205 (1827) .. *algæ*.
Cryphia, Hübn. Verz., p. 205 (1827) .. *receptricula*.
Jaspidea, Hübn. Tent., ined *algæ*.
- A. Forewing with the postmedial line minutely dentate or waved.
- a. Forewing with the claviform filled in with whitish.
- a¹. Forewing with the medial shade interrupted in submedian interspace *nilgiria*.
- b¹. Forewing with the medial shade not interrupted in submedian interspace.
- a². Forewing with the antemedial line oblique .. *albiclava*.
- b². Forewing with the antemedial line erect .. *poliophæa*.
- b. Forewing with the claviform not filled in with whitish.
- a¹. Hindwing with the ground-colour yellow .. *deceptura*.
- b¹. Hindwing with the ground-colour not yellow.
- a². Forewing with the cilia chequered white and blackish.
- a³. Forewing with the postmedial line incurved at discal fold *lichenæa*.
- b³. Forewing with the postmedial line not incurved at discal fold *literata*.
- b². Forewing with the cilia not chequered white and black.
- a³. Forewing ochreous suffused with fuscous.
- a⁴. Hindwing wholly suffused with brown .. *modesta*.
- b⁴. Hindwing white, the terminal area suffused with brown *ochrophæa*.

- b³. Forewing more or less tinged with green or
 olive *virescens*.
- B. Forewing with the postmedial line not dentate or
 waved.
- a. Forewing with the postmedial line oblique or
 slightly incurved below vein 4 *ravula*.
- b. Forewing with the postmedial line strongly incurv-
 ed below vein 4 *ochrota*.

1976. BRYOPHILA NILGIRIA.

1976a. BRYOPHILA ALBICLAVA.

Bryophila albiclava, Hmps., Cat. Lep. Phal. B. M. vii, p.
 622, pl. 122, f. 11 (1908).

♀. Head and thorax white; palpi and antennæ blackish; frons with black patch; tegulæ and patagia edged with black; legs irrorated with brown, the tarsi blackish ringed with white; abdomen pale-yellowish brown. Forewing white with a faint bluish tinge and sparsely irrorated with black-brown; subbasal line black, double, waved, extending to inner margin, with black-brown suffusion before and beyond it on costa; antemedial line double oblique, waved, the inner line interrupted; claviform white defined by black; orbicular and reniform large, white defined by black except above, the former with black-brown centre defined by black, round, conjoined to antemedial line, the latter with small black lunule on inner side of centre; medial area black-brown to the indistinct curved minutely waved medial line; postmedial line double, slightly bent outward below costa, then dentate, excurved to vein 4, then strongly incurved, the costal area beyond it black-brown with some white points on costa; subterminal line black-brown, angled outwards above and below vein 6, incurved at discal fold to postmedial line, slightly excurved at middle, then angled inwards at submedian fold and outward at vein 1; a terminal series of small black lunules; cilia chequered black-brown and white. Hindwing white tinged with reddish brown; a faint discoidal spot, curved postmedial line, and diffused subterminal band; a terminal series of slight dark lunules; the underside white tinged with brown, the costal and terminal area irrorated with brown, a blackish discoidal spot and faint curved postmedial line.

Habitat.—KASHMIR, Gorrals Valley. *Exp.* 36 mill.

1976b. BRYOPHILA POLIOPHÆA.

Bryophila poliophæa, Hmps., Cat. Lep. Phal. B. M. vii, p. 622,
 pl. 122, f. 12 (1908).

Head and thorax whitish mixed with olive-brown and irrorated with black; palpi blackish, the extremity of 2nd joint white; antennæ black; tegulæ and patagia edged with black; tarsi blackish ringed with white; abdomen grey-white suffused with brown. Forewing whitish tinged with

pale olive-green and irrorated with fuscous; subbasal line black defined by white on outer side, oblique, waved, from costa to vein 1, with a small black spot beyond it in cell and some fuscous suffusion on costal and inner areas; antemedial line double, black filled in with white, the lines well separated and the inner line indistinct, slightly sinuous; claviform pale defined by black, with a short white streak defined by black above its extremity on median nervure; orbicular, a minute black annulus; reniform an oblique black bar; traces of an oblique minutely waved black line from lower angle of cell to inner margin; the medial area suffused with fuscous; postmedial line double filled in with whitish, slightly bent outwards below costa, then minutely waved, obliquely excurved to vein 4, then strongly incurved, some fuscous suffusion beyond it on costal area with white points on costa; subterminal line very indistinct, blackish, minutely waved, angled outwards at vein 7 and incurved at discal fold and below vein 3; a terminal series of minute black lunules; cilia chequered brownish-white and fuscous. Hindwing whitish uniformly suffused with brown; a faint discoidal spot and curved postmedial line; a slight dark terminal line; cilia white faintly tinged with brown, the underside brownish white with some dark irroration on terminal area, a black discoidal spot and somewhat diffused curved postmedial line.

Habitat.—KASHMIR, Chamba, Kardrug. *Exp.* 30 mill.

1978. BRYOPHILA DECEPTURA.

Diphthera deceptura, Wlk. XXXII, 614 (1865).

Bryophila postochrea, Hmps., Ill. Het. B. M. ix, p. 95, pl. 161, f. 8, (1893).

1975. BRYOPHILA LICHENEA.

1972. BRYOPHILA LITERATA.

1973. BRYOPHILA MODESTA.

1973a. BRYOPHILA OCHROPHÆA.

Bryophila ochrophæa. Hmps. Cat. Lep. Phal. B. M. vii, p. 631, pl. 122, f. 21 (1908).

Head and thorax brownish-white slightly irrorated with brown; palpi with blackish patch on 2nd joint; tarsi banded with blackish; abdomen ochreous white with faint dorsal brown bands, the ventral surface white. Forewing brownish-white irrorated with black-brown; subbasal line represented by blackish bars from costa and cell with dark marks beyond it on costa, in cell, and above inner margin; antemedial line blackish indistinctly double except towards costa, waved, almost erect, a band of thick dark irroration beyond it; orbicular and reniform with blackish centres and slight dark outlines, the former small, round, the latter somewhat constricted at middle; an indistinct waved medial line from cell to inner margin; postmedial line with small black spot at costa, slightly bent outwards below costa and incurved at discal fold, incurved and some-

what dentate below vein 4; subterminal line only defined by a band of dark irroration on its inner side, excurved below vein 7 and at middle and incurved at discal and submedian folds; a terminal series of black striae. Hindwing white faintly tinged with brown; cilia pure white; the underside white faintly tinged with brown.

Habitat.—KASHMIR, Dras. *Exp.* 24-30 mill.

1974. *BRYOPHILA VIRESCENS*.

1974a. *BRYOPHILA RAVULA*.

Noctua ravula, Hübn. Eur. Schmett. Noct. f. 461 (1818); Staud. Cat. Lép. Pal., p. 166.

„ *lupula*, Hübn. Eur. Schmett. Noct. f. 573 (1818); Dup. Lép. Fr. vii., p. 367, pl. 122, f. 6 and Suppl. iv., pl. 69, f. 4; Frr. Neue. Beitr. pl. 170 ff. 4-5; Herr. Schöff. Eur. Schmett. Noct. f. 86.

Bryophila ereptricula, Treit. Schmett. Eur. (I), p. 66, (1825); Dup Lép. Fr. vii, p. 236, pl. 115, f. 4; Frr. Beitr. pl. 84, ff. I, 2 and pl. 129; id. Neue. Beitr. pl. 52, f. 2; Boisd. Icones., pl. 71, f. 5.

„ *trogodyta*, Frr. Neue. Beitr. I, p. 102, pl. 52, f. 1 (1833).

„ *vandalusica*, Dup. Lép. Fr. Suppl. iv., p. 405, pl. 82, f. 9 (1842); Herr. Schöff. Eur. Schmett. Noct. f. 569; Rmbr. Cat. Lép. S. Aud., pl. 6, ff. 1-2.

Head and thorax greyish mixed with red-brown and fuscous; palpi blackish, white at base; frons with lateral black bars; pectus and legs whitish mixed with black, the tarsi blackish tinged with white, abdomen whitish suffused with brown, the crests black. Forewing red-brown with some dark irroration, some whitish at base of inner margin; the antemedial area and costal area to postmedial line suffused with fuscous and irrorated with grey, some whitish suffusion beyond postmedial line; subbasal line double, curved, from costa to vein 1, above which there is a whitish patch beyond it; antemedial line double, somewhat inwardly oblique, and bent inwards to inner margin, the inner line slightly angled inwards in submedian fold; claviform represented by a slight brown striga at extremity; orbicular defined by black, elliptical; reniform with greyish centre slightly defined by black, and whitish annular slightly defined by black, constricted at middle; an oblique dark striga from middle of costa and faint incurved line from lower angle of cell to inner margin; postmedial line double filled in with whitish, the outer line indistinct, bent outwards below costa, excurved to vein 4, then incurved and slightly excurved at vein 1; the postmedial costal area blackish with oblique outer edge, and some grey points on costa; an indistinct minutely waved brown subterminal line, excurved below vein 7 and at middle; a black shade before termen from below apex to vein 3; a fine black terminal line;

cilia grey and fuscous with a dark line through them. Hindwing white, the veins and terminal area tinged with brown; cilia white, tinged with brown at apex and with slight brown marks at middle; the underside white; the costa and terminal area to vein 2 irrorated with brown, a small discoidal spot and sineous postmedial line.

ab. 1. ereptricula. Forewing darker, the basal area diffused with white, the terminal area with diffused white spots towards costa and tornus.

ab. 2. vandalusia. Forewing much greyer; hindwing white in male. Spain, Asia Minor, Mesopotamia.

ab. 3. Similar, but forewing with the antemedial area rufous. Syria.

Habitat.—EUROPE; ALGERIA; ASIA MINOR; SYRIA; MESOPOTAMIA; KASHMIR, Dana. *Exp.* 24-30 mill.

Larva.—Kirby, Butt. and Moths. Eur. p. 160; Hffm. Raup., p. 77.

Blue with a black dorsal line and yellowish red lateral stripe defined below by black. Food plants: Lichens on Walls. 5-6.

1974b. *BRYOPHILA OCHROTA.*

Bryophila ochrota, Hmps., Cat. Lep. Phal. B. M. vii., p. 641, pl. 122, f. 27 (1908).

Head and thorax white tinged with brown; 2nd joint of palpi with blackish patch at sides; tarsi banded with blackish; abdomen ochreous white with dorsal brownish bands. Forewing ochreous white mostly suffused with brown and irrorated with fuscous, the medial area rather darker; subbasal line indistinctly double filled in with whitish and with some rufous scales on it, from costa to submedian fold; antemedial line indistinctly double filled in with whitish and with some rufous on outer line, bent inwards to costa, then minutely waved; claviform with its extremity faintly defined by blackish; orbicular and reniform with brownish centres and slight whitish annuli faintly defined by blackish, the former round, the latter somewhat constricted at middle; traces of a waved medial line from cell to inner margin; postmedial line double filled in with whitish, some rufous on the inner line, bent outwards below costa, strongly excurved to vein 4, then strongly incurved, some white points beyond it on costa; traces of a pale minutely waved subterminal line below vein 3; a terminal series of minute dark lunules defined on inner side by slight pale lunules; cilia with a slight whitish line through them. Hindwing white, faintly tinged with brown; cilia pure white; the underside white faintly tinged with brown.

Habitat.—KASHMIR, Dras; BELOOCHISTAN, Quetta. *Exp.* 26 mill.

Genus *IAMBIA*.

Type.

Iambia wk, xxvii. 109 (1863) *inferalis*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about

to middle of frons and moderately scaled, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the prothorax without crest, the metathorax with spreading crest: tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen very slightly crenulate and somewhat excised from vein 3 to tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

- A. Forewing with two of the terminal points confluent and forming a lunule at discal fold.
 - a. Forewing with small wedge-shaped white marks before subterminal line above and below vein 4. . . *nocturna*
 - b. Forewing without small wedge-shaped white marks before subterminal line.
 - a¹. Forewing with pale streaks on veins 6 and 4 intersecting the dark postmedial patch . . . *harmonica*.
 - b¹. Forewing without pale streaks on veins 6 and 4 intersecting the dark postmedial patch . . . *thuaitesi*.
 - B. Forewing without terminal lunule at discal fold.
 - a. Forewing whitish suffused with grey-brown . . . *transversa*.
 - b. Forewing with the ground colour bright rufous . . . *rufescens*.
- 1838a. IAMBIA NOCTURNA.
 1839c. IAMBIA HARMONICA.
 1866. IAMBIA THUAITESI.
 1867. IAMBIA TRANSVERSA.
 1870. IAMBIA RUFESCENS.

Genus IAMBIODES.

Type.

Iambiodes, Hmps. Cat. Léop. Phal. B. M. vii., p. 659 (1908). *anormalis*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and rather broadly scaled, the 3rd moderate; frons with large prominence with raised corneous walls at extremity; eyes large, round; antennæ of female somewhat laminate; thorax clothed almost entirely with scales, the prothorax without crest, the mesothorax with small paired crests, the metathorax with decumbent crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins

3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2025*a*. IAMBIODES ANORMALIS.

Genus PARIAMBIA.

Type.

Pariambia, Hmps., Cat. Lep. Phal. B. M. vii., p. 660, (1908).. *pulla*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd moderate; frons with rounded prominence with vertical corneous ridge down middle; eyes large round; antennæ of male minutely ciliated; thorax clothed almost entirely with scales and without crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5, obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Metathorax without white patch; forewing reddish

brown suffused with fuscous *pulla*.

B. Metathorax with white patch; forewing grey suf-

fused with fuscous *unduligera*.

2089. PARIAMBIA PULLA.

Acontia pulla, Swinh., P. Z. S., 1885, p. 456, pl. 27, f. 15.

Pariambia aprepes, Hmps., Cat. Lep. Phal. B. M. vii., p. 660 (1908).

2078. PARIAMBIA UNDULIGERA.

Genus AUCHA.

Type.

Aucha, Wlk., xiii., 1137 (1857) *velans*.

A. Hindwing with orange patch below and beyond end of cell.

a. Forewing with the antemedial, postmedial, and terminal areas strongly suffused with grey .. *nectens*.

b. Forewing uniform dark brown slightly suffused with grey *velans*.

B. Hindwing nearly uniform dark brown *minor*.

1664. AUCHA NECTENS.

1663. AUCHA VELANS.

1663*a*. AUCHA MINOR.

Aucha minor, Hmps., Cat. Lep. Phal. B. M. vii., p. 666, pl. 123 f. 11 (1908).

♀. Head and thorax dark brown tinged with grey; pectus and legs greyer, the tarsi slightly ringed with white; abdomen grey-brown with

a reddish tinge. Forewing dark chocolate-brown largely suffused with grey; traces of a double curved sinuous antemedial line with an oblique dark brown shade beyond it from costa to median nervure; orbicular and reniform absent; an indistinct medial line, oblique from cell to inner margin; postmedial line indistinct, brown, dentate, oblique from costa to vein 6, slightly angled inwards at discal fold, incurved below vein 4, a triangular red-brown patch beyond it on costal area with some grey points on the costa; an indistinct waved brown subterminal line; a terminal series of slight brown spots. Hindwing red-brown with the terminal area dark brown; cilia pale rufous with a red-brown line near base; the underside greyish suffused with rufous except on inner area to the indistinct curved postmedial line, a slight discoidal lunule.

Habitat.—BOMBAY, KARWAR, *Exp.* 26 mill.

Genus POLYPHÆNIS.

Type.

Polyphænis, Boisd., Ind. Meth., p. 128 (1840). *sericata*.

Triphænopsis, Butl. A. M. N. H. (5) i., p. 163 (1878) . . . *lucilla*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd typically moderate; frons smooth; eyes large, round; antenna of male typically bipectinate with short branches; the apical part serrate; thorax clothed almost entirely with scales, the prothorax with spreading crest, the metathorax with divided crest; abdomen with dorsal series of crests. Forewing with the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cel. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. iv. (*Triphænopsis*). Antennæ of male ciliated.

A. Palpi with the 3rd joint very long and porrect.

1749. POLYPHÆNIS PULCHERRIMA.

Epilecta pulcherrima, Moore, P. Z. S., 1867, p. 54, pl. 6, f. 3.

Polyphænis largetani, Obuth. Et. Ent. vi., p. 19, pl. viii, f. 4 (1881).

Epilecta opulenta, Butl. P. Z. S., 1883, p. 160.

B. Palpi with the 3rd joint short.

a. Hindwing with the inner edge of the terminal band
strongly incurved at discal fold *confecta*.

b. Hindwing with the inner edge of the terminal
band not incurved at discal fold

a¹. Hindwing with the inner area brown.

a². Hindwing with dark discoidal striga, the post-
medial line absent *diminuta*.

61. Hindwing without discoidal striga, a slight postmedial line from vein 6 to inner margin. *inepta*.

b. Hindwing with the inner area not brown .. *indica*.

1748. POLYPHÆNIS CONFECTA.

1746. POLYPHÆNIS DIMINUTA.

1745. POLYPHÆNIS INEPTA.

1747. POLYPHÆNIS INDICA.

Genus ARÆA.

Type.

Aræa, Hmps., Cat. Lep. Phal. B. M. vii., p. 688 (1908) .. *attenuata*.

Proboscis fully developed; palpi upturned, slender, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male minutely ciliated; build slender; head and thorax roughly clothed with hair and scales mixed, the pro- and metathorax with loose spreading crests; tibiæ fringed with rather long hair; abdomen with some rough hair at base, but without crests, the female with long exerted ovipositor. Forewing narrow and elongate, the apex rounded, the termen obliquely curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3+4 from angle of cell; 5 obsolescent from middle of discocellulars; 6+7 stalked; 8 anastomosing with the cell near base only.

1971. b. ARÆA ATTENUATA, Hmps., Cat. Lep. Phal. B. M. vii., p. 688 (1908).

Head and thorax grey mixed with dark brown; palpi black except in front; frons with lateral black bars; tarsi black with pale rings; abdomen brownish grey. Forewing brown tinged with grey and irrorated with black; subbasal line black, somewhat dentate, from costa to submedian fold; a black streak below the cell confluent with the lower edge of claviform, which is narrow and acuminate; antemedial line strong, black, slightly angled outwards below costa, then minutely waved; orbicular and reniform grey irrorated with brown and strongly defined by black, the former round or oblique elliptical, open above; the discal and postmedial areas more strongly suffused with brown; postmedial line strong, black, defined on outer side by whitish, but outwards below costa, then dentate, strongly excurved to vein 4, then very oblique, some white points beyond it on costa; subterminal line diffused, white, angled outwards at vein 7 and inwards at discal and submedian folds, at former to postmedial line, with short black streak beyond it above and below vein 5; a terminal series of small black lunules; cilia white with brownish line through them. Hindwing whitish suffused with brown; a slight brown terminal line; cilia

white with a brownish line through them except towards tornus; the under-side white irrorated with brown, a blackish discoidal spot and indistinct curved postmedial line.

Habitat.—KASHMIR, Seinde Valley, Goorais Valley. *Exp.* 34 mill.

Genus CANNA.

Type.

Canna, Wlk., xxxiii. 790. (1865) *pulchripicta*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair, the 3rd short; frons smooth; eyes large, round; antennæ of male laminate; thorax clothed with elongate scales, the prothorax without crest; the mesothorax with paired tufts of scales, the metathorax with spreading crest; the patagia with upturned tufts of scales at extremity; tibiæ fringed with long hair; abdomen with dorsal series of crests, the crest on 4th segment large. Forewing short and broad, the apex rounded, the termen excurved at middle and excised below apex and towards tornus which is somewhat lobed; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Abdomen with the crest on 4th segment formed of long black scales.

a. Forewing with the medial band green tinged with fuscous *prasinaria*.

b. Forewing with the medial band red-brown *malachitis*.

B. Abdomen with the crest on 4th segment formed of ochreous hair *pulchripicta*.

1965. CANNA PRASINARIA.

1964. CANNA MALACHITIS.

1963. CANNA PULCHRIPICTA.

Genus DASEOCHÆTA.

Type.

Daseochæta, Warren, Seitz., *Macrolepidoptera*, pt. 9, p. 11

(1907) *viridis*.

Diphtherocome, Warren, Seitz, *Macrolepidoptera*, pt. 9, p. 11

(1907) *pallida*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and fringed with hair in front, the 3rd rather long, naked; frons smooth; eyes large, round; antennæ of male typically bipectinate with long branches to apex; thorax clothed with long rough hair and hair-like scales, the pro- and metathorax with spreading crests, the patagia

tufted at extremity; tibiae fringed with hair; abdomen with dorsal series of crests, large at middle. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II. (Diphtherocone). Antennæ of male bipectinate with moderate branches, the apical fourth ciliated.

1967. *DASEOCHETA PALLIDA*.

Sect. III. Antennæ of male bipectinate with short branches, the apical third ciliated.

A. Hindwing with broad brownish subterminal band .. *vigens*.

B. Hindwing without subterminal band.

a. Forewing with large quadrate black mark in out-
median interspace before postmedial line .. *brevipennis*.

b. Forewing with slight black spot in submedian
interspace before postmedial line *fasciata*.

1966. *DASEOCHETA VIGENS*.

1967a. *DASEOCHETA BREVIPENNIS*.

Daseochata brevipennis, Hmps., Cat. Lep. Phal. B. M. viii., p. 27, pl. 123,
f. 21 (1909).

Head and thorax pale blue-green; palpi black; antennæ brown; shoulders with black patches; tibiae with black spots, the tarsi banded black and white; abdomen ochreous white dorsally suffused with ochreous brown, ventrally black-brown. Forewing pale blue-green, the basal and post-medial areas suffused with olive-green; subbasal line represented by a black striga from costa; a short black streak in base of sub-median fold, and a curved black streak above inner margin from near base to the antemedial line, which is black defined on outer side by white, incurved in cell, angled outwards in submedian fold, then incurved and ending at the streak above inner margin; claviform minute, defined by some black scales above and at extremity; orbicular and reniform defined by black and white at sides and with quadrate black patch between them, the former small, round, sometimes defined by black below; a black bar from middle of costa and oblique striga from inner margin; the medial area with white fascia in submedian fold ending in a quadrate black spot before postmedial line with spurs above and below from its inner edge; postmedial line black defined by white on inner side, bent outwards below costa, incurved at discal fold, excurved and slightly angled at veins 4·3, then strongly incurved to submedian fold, and excurved to inner margin, some black points beyond it on costa, followed by a triangular spot; a series of black points formed by diffused scales towards

termen; cilia with series of black lunules at tips. Hindwing white faintly tinged with green; a diffused blackish discoidal spot, with diffused band, from it to inner margin, and traces of a postmedial line at middle and towards tornus; the underside with slight black streak in middle of cell diffused curved medial band blacker towards costa and more or less confluent with the discoidal spot, much interrupted postmedial line, and series of black points before termen.

Habitat.—SIKIM; TIBET. Yatong. *Exp.* 32 mill.

1967b. *DASEOCHÆTA FASCIATA*.

Diphthera fasciata, Moore, P. Z. S., 1888, p. 408, Butl. Ill. Het. B. M. vii., p. 30, pl. 122, f. 1.

Palpi black, white at tips; head brownish white, the vertex green, the sides of frons black, the antennæ brown, white at base; tegulæ and patagia blue-green, the dorsum of thorax brownish white; pectus green at sides, black-brown ventrally; tibiæ green with black marks, the tarsi banded black-brown and white; abdomen brownish white with a large black-brown ventral patch. Forewing pale blue-green with some darker suffusion before the antemedial line and beyond the postmedial line; subbasal line represented by a black joint on costa followed by a bar; a very short black streak below base of cell and an oblique white fascia above a curved black fascia on inner area extending to the antemedial line, which is represented by an oblique striga from costa and a line slightly defined on outer side by white from subcostal nervure to the black fascia above inner margin, bent outwards at median nervure, angled outwards at submedian fold, then incurved; the medial area with white streak in submedian fold with black point on it at extremity of claviform; orbicular and reniform defined by black and white at sides with quadrate black patch between them, open above and below, the former round, a black bar from costa to the black patch, a point on inner margin and a small black lunule in submedian fold on inner edge of the postmedial line, which is represented by two black points on costa and black line defined on inner side by white from below costa, much nearer termen, angled inwards at discal fold, outwards at veins 4·3, then bent inwards and outwardly oblique to inner margin, a black spot with white point on it beyond it on costa; cilia with slight black-brown lunules at tips. Hindwing pale blue-green with some ochreous hair on inner area; a diffused blackish discoidal spot; the underside with strong black bar from costa to the discoidal spot and two spots on inner area, postmedial points below costa and vein 7 and small spots in discal and submedian folds and above inner margin.

Habitat.—W. CHINA; PUNJAB, Laka; SIKHIM. *Exp.* 44 mill.

Sect. IV. Antennæ of male serrate and fasciculate.

1968a. *DASCOCHÆTA CHRYSOCHLORA*.

Sect. V. Antennæ of male ciliated.

- A. Forewing with black postmedial band interrupted
by white streaks on veins 6, 4, 3, 2. *muscosa*.
B. Forewing with the postmedial band not interrupted
by white streaks *discibrunnea*.

1977. *DASCOCHÆTA MUSCOSA*.

Bryophila muscosa, Hmps. Ill. Het. B. M. viii., p. 72, pl. 144, f. 15 (1891).

Diphthera imray, Hmps. J. Bomb. Nat. Hist. Soc. xvii., p. 472 (1906).

1968. *DASCOCHÆTA DISCIBRUNNEA*.

Genus THALATHA.

Type.

Thalatha, Wlk., Journ. Linn. Soc. Zool. vi., p. 187 (1862) *sinens*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd moderate; frons with very small corneous prominence at middle with raised edges; eyes large, round; antennæ of male typically laminate; thorax clothed chiefly with scales and without crests; tibiæ moderately fringed with hair; abdomen with dorsal crests at base only. Forewing with the apex typically rounded, the termen evenly curved and very slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked or from angle; 8 anastomosing with the cell near base only.

- A. Forewing with terminal series of small black spots.. *conjecturalis*.
B. Forewing with terminal series of slight dark striæ.. *sinens*.

1817. *THALATHA CONJECTURALIS*.

Thalatha sinens, Wlk., Journ. Linn. Soc. Zool. vi., p. 187 (1862)
var. nec. 1856.

Bryophila conjecturalis, Swinh. Trans. Ent. Soc. 1890, p. 222, pl.
vii., f. 10.

1816. *THALATHA SINENS*.

Genus GOENYCTA.

Type.

Goenyceta, Hmps., Cat. Lep. Phal. B. M. viii., p. 49 (1909). *niveiguttata*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to middle of frons and moderately fringed with hair in front, the 3rd short; frons with rounded prominence with corneous plate below it; eyes large, round; antennæ of female ciliated; thorax smoothly clothed with scales only and without crests; tibiæ moderately fringed with hair; abdomen with dorsal series of crests, the crest on segments 3·4·5 large. Forewing rather narrow, the margins subparallel, the apex rounded, the termen slightly excurved at middle and not crenulate; veins 3 and 5 from near

angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars, 6·7 from upper angle; 8 anastomosing with the cell near base only.

1993a. GOENYCTA NIVEIGUTTATA.

Genus TYCRACONA.

Type.

Tycracona, Moore, Lep. Atk. p. 95 (1882) *obliqua*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled, the 3rd porrect, short; frons with small rounded prominence at middle; eyes large, round; antennæ laminate; thorax clothed almost entirely with scales and without crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing triangular, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen strongly curved; veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1823. TYCRACONA OBLIQUA.

Genus CRANIOPHORA.

Type.

Craniophora, Snell. Vlind. van. Ned. ii, p. 262 (1872) *ligustri*.

Bisulcia, Chapman, Ent. Rec. i. p. 28 (1890) *ligustri*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ simple and laminate in both sexes; thorax clothed with scales mixed with hair; the prothorax without crest, the metathorax with divided crest; tibiæ moderately fringed with hair; abdomen with dorsal series of crests and rough hair at base. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with prominent black fascia in submedian fold extending to termen.

a. Forewing with the claviform large, defined by black. *nigrivitta*.

b. Forewing with the claviform absent *fasciata*.

B. Forewing without prominent black fascia in submedian fold *nubilata*.

1820. CRANIOPHORA NIGRIVITTA.

1822. CRANIOPHORA FASCIATA.

Acronycta fasciata, Moore, Lep. Ceyl. iii., p. 5, pl. 144, f. 4 (1884).*Hyboma divisa*, Moore, P. Z. S. 1888, p. 409; Butl. Ill. Het.

B. M. vii., p. 45, pl. 125, f. 7.

Acronycta nigrostriata, Pag. Jahrb. Nass. Ver, xli., p. 128 (1889).

1711. CRANIOPHORA NUBILATA.

Genus ACRONYCTA.

Type.

- Acronicta*, Ochs. Schmett. Eur. iv., p. 62 (1815). non descr. *leporina*.
Acronycta, Treit. Schmett. Eur. v. (1). p. 3. (1825) *leporina*.
Hyboma, Hübn. Verz., p. 200 (1827) *strigosa*.
Triæna, Hübn. Verz. p. 200 (1827) *psi*.
Jocheæra, Hübn. Verz., p. 201 (1827) *alni*.
Pharetra, Hübn. Verz. p. 202 (1827) *auricoma*.
Arctomyscis, Hübn. Verz. p. 202 (1827) *aceris*.
Microcalia, Guen. Noct. i., p. 33 (1852) *fragilis*.
Megaacronycta, Grote, Bull. Buff. Soc., Nat. Sci. i, p. 79 (1873) *hastulifera*.
Lepitoreuma, Grote, Bull. Buff. Soc. Nat. Sci. i, p. 80 (1873) *ovata*.
Plataplecta, Butl. A. M. N. H. (5) i., p. 195 (1878) *pruinosa*.
Mastiphanes, Grote, New Check List, p. 23 (1882) non. descr. *edolata*.
Viminia, Chapman, Ent. Rec. i., p. 26 (1890) *rumicis*.
Cuspidia, Chapman, Ent. Rec. i, p. 27 (1890) *psi*.
Pseudopunda, Butl. Trans. Ent. Soc. (1890) p. 672 *bicolor*.
Tricholonche, Grote, Mitth. Hildersheim, iii, p. 16 (1896) .. *afflicta*.
Philorgyia, Grote, Mitth. Hildersheim Mus. iii, p. 17 (1896)... *luteicoma*.
Apatela, Hübn. Tent. ined *aceris*.

Sect. I. (*Hyboma*).—Thorax clothed chiefly with scales.

- A. Forewing with distinct black streak from post-medial line to termen in submedian fold *albiorbis*.
 B. Forewing without distinct black streak from post-medial line to termen in submedian fold.
 a. Forewing without prominent white spot on post-medial line in submedian fold *pruinosa*.
 b. Forewing with prominent white spot on postmedial line in submedian fold *rumicis*.

1818 b. ACRONYCTA ALBIORBIS.

Plataplecta pruinosa, Moore, Lep. Ceyl. iii, p. 5, pl. 144, f. 3 (nec. Guen).*Acronycta albiorbis*, Hmps., Cat. Lep. Phal. B. M. viii, p. 74 (1909).

Head and thorax white mixed with reddish brown; palpi with blackish mark on 2nd joint above; tegulæ and patagia edged with blackish; abdomen whitish suffused with pale yellow-brown. Forewing white almost entirely suffused with pale rufous; subbasal line represented by a black

striga from costa; a rather diffused sinuous black streak in submedian fold from base to the antemedial line which is double, the lines widely separated towards costa, oblique, waved, with black point on the outer line at submedian fold with white streak from it to the medial line; orbicular rather quadrate, extending to the antemedial line and defined on outer side by an oblique black striga; reniform large, rather quadrate, incompletely defined by black except above and with slight dark lunule on inner side of centre; a slight dark patch at middle of costa and brownish line from cell to inner margin angled outwards at vein 1; postmedial line double filled in with whitish lunules, bent outwards below costa, then minutely dentate, excurved to vein 4, then incurved, crossed by a black streak in submedian fold from medial to subterminal lines, some brown suffusion beyond it in discal and submedian folds; subterminal line found by ill-defined white lunules; some slight black strigæ on termen defined by whitish lunules. Hindwing whitish suffused with pale red-brown; an indistinct postmedial line defined on outer side by whitish; the underside white tinged with red-brown, the costal and terminal areas slightly irrorated with brown, a brownish patch on middle of costa, slight discoidal spot and diffused postmedial line, oblique and waved to vein 5, then incurved.

ab. 1. Greyer and irrorated with dark-brown; forewing with the white lunules on postmedial line smaller and less distinct. Travancore.

Habitat.—TRAVANCORE, Pirmád; CEYLON, Pundaluoya. *Exp.* ♂ 38; ♀ 42 mill.

1818. ACRONYCTA PRUINOSA.

Acronycta pruinosa, Guen. Noct. 1, p. 53 (1852); Hmps., Cat.

Lep. Phal. B. M. viii, p. 91, pl. 125, f. 10.

Polia soluta, Wlk., xxxiii. 723 (1865).

1696. ACRONYCTA RUMICIS.

Noctua rumicis, Linn. Syst. Nat. ed. x., p. 516 (1758); Esp.

Schmett. iv, pl. 17, ff. 7-9; Hübn. Eur. Schmett. Noct., f. 9

Frr. Neue Beit., pl. 543; Steph. Ill. Brit. Ent. Haust., iii

p. 42; Dup. Lep. Fr. vi, p. 241, pl. 88, f. 2; Staud. Cat. Lep.

Pal., p. 133.

Acronycta salicis, Curt. Brit. Ent., v. pl. 136 (1829).

„ *diffusa*, Wlk. xi, 708 (1857).

„ *indica*, Moore, P. Z. S. 1867, p. 1 47.

„ *turanica*, Staud., Stett. Ent. Zeit., 1888, p. 65; id. Rom.

Mém. v., pl. 8, f. 5.

„ *alnoides*, Grest, Allg. Zeit. Ent., viii, p. 310 (1903).

Sect. II. (Triena).—Thorax clothed with hair like scales mixed with a few scales.

A. Forewing with the orbicular and reniform conjoined by a black streak.

- a.* Forewing with black streak in discal fold beyond postmedial line *maxima*.
- b.* Forewing without black streak in discal fold beyond postmedial line.
 - a*¹. Forewing without black shade in submedian interspace from base to termen *iria*.
 - b*¹. Forewing with black shade in submedian interspace from base to termen *rubiginosa*.
- B.* Forewing without black streak between orbicular and reniform.
 - a.* Forewing with distinct black streak below base of cell *gastridia*.
 - b.* Forewing without black streak below base of cell. *bicolor*.

1813. ACRONYCTA MAXIMA.

Acronycta maxima, Moore, P. Z. S. 1881, p. 333; Hmps., Cat. Lep. Phal. B. M., viii., p. 112, pl. 125, f. 21.

1813a. ACRONYCTA IRIA.

Acronycta iria, Swinh., A. M. N. H. (7) iii, p. 113 (1899); Hmps., Cat. Lep. Phal. B. M. viii, p. 113, pl. 125, f. 22.

♂. Head and thorax grey suffused with pale red-brown; palpi white, the 2nd joint with black band; antennæ with the basal joint black behind at tip; shoulders with black streak; tibiæ streaked with black; abdomen whitish dorsally tinged with brown. Forewing whitish suffused and irrorated with pale red-brown; subbasal line represented by double oblique dark striæ from costa; a sinuous black streak in submedian fold from base to antemedial line where it forks, giving off a slight spur below at middle; antemedial line indistinct, double, the lines very widely separated on costal half; oblique, waved, angled inwards on vein 1 and excurved above inner margin, the outer line angled outwards below costa; orbicular and reniform defined by fuscous, the former whitish with slight rufous centre, rather oblique elliptical, with a black streak from it extending into the reniform which has a rufous centre; a diffused oblique fuscous line from costa to reniform and traces of an oblique sinuous line from lower angle of cell to inner margin at antemedial line; postmedial line double, black filled in with white, the inner line incomplete, bent outwards below costa, then dentate, strongly incurved below vein 4, crossed by a black streak in submedian fold from well before it to termen towards which it expands, some whitish points beyond it on costa; the veins of terminal area with slight dark streak; faint traces of a minutely waved whitish subterminal line with slight dark streaks in the interspaces from it to the series of small black spots on termen and base of cilia, which are white with a slight black line through them. Hindwing white, the veins tinged with brown, the terminal area slightly suffused with brown from apex to submedian fold

and with a terminal series of slight dark lunules; the underside with the costal area slightly irrorated with brown, a black discoidal spot, faint traces of postmedial line with blackish spot in submedian fold and terminal series of slight dark lunules.

♀. Hindwing with indistinct sinuous postmedial line and the terminal area more suffused with fuscous.

Habitat.—PUNJAB, Kulu, Sultanpur. *Exp.* 50-54 mill.

1819. *ACRONYCTA RUBIGINOSA*.

Acronycta rubiginosa, Wlk., Journ. Linn. Soc. Zool. vi., p. 178, (1862).

Tricena denticulata, Moore, P. Z. S., 1888, p. 408; Butl., Ill. Het. B. M. vii., p. 45, pl. 125, f. 8.

1815. *ACRONYCTA GASTRIDIA*.

Acronycta aceris, Hmps., Moths. Ind. ii, p. 241 (nec. Linn.)

„ *gastridia*, Swinh., A. M. N. H. (6) xv, p. 5 (1895).

1821. *ACRONYCTA BICOLOR*.

Genus SIMYRA.

Type.

Simyra, Ochs. Schmett. Eur. iv., p. 18 (1816), non. descr.;

Treit. Schmett. Eur. (5) ii, p. 280 (1825) .. *albovenosa*.

Arsilonche, Led. Noct. Eur., p. 70 (1857) *albovenosa*.

Proboscis aborted, minute; palpi porrect, extending to beyond the frons and clothed with long hair; frons smooth; eyes rather small, round; antennæ of male typically laminate; thorax clothed with hair only and without crests; tibiæ fringed with long hair; abdomen dorsally clothed with rough hair at base and with lateral fringes of hair, but without crests. Forewing with the apex somewhat produced and acute, the termen obliquely curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell or shortly stalked; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing nearly uniform rufous, the costal edge white. *albicosta*.

B. Forewing with the costal edge not white.

a. Forewing pale rufous thickly irrorated with rufous .. *confusa*.

b. Forewing ochreous white sparsely irrorated with rufous *conspersa*.

1944a. *SIMYRA ALBICOSTA*.

Simyra albicosta, Hmps., Cat. Lep. Phal. B. M. viii, p. 178, pl. 127, f. 15 (1909).

♀. Head and thorax white, the head, tegulæ, prothorax, front of pectus and legs suffused with rufous; abdomen white tinged with red-brown. Forewing rufous, the costal edge white, the median nervure and veins of

terminal half slightly streaked with white; a white spot at base of costa; cilia tipped with white. Hindwing white faintly tinged with red-brown; cilia white.

Habitat—MADRAS, Nilgiris. *Exp.* 40 mill.

1944. SIMYRA CONFUSA.

1949. SIMYRA CONSPERSA.

Genus CETOLA.

Type.

Cetola, Wlk. v., 1015 (1855) *dentata*.

A. Forewing with crimson suffusion on costal area to beyond middle *rubricosta*.

B. Forewing with fuscous suffusion on costal area to beyond middle *dentata*.

2348a. CETOLA RUBRICOSTA.

2348. CETOLA DENTATA.

Genus MATOPO.

Type.

Matopo, Dist. A. M. N. H. (7) i, p, 227 (1898) *typica*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short, porrect; frons with large rounded prominence with corneous plate below it; eyes large, round; antennæ of male typically bipectinate with rather long branches, the apex simple; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male minutely serrate, of female ciliated.

2672. MATOPO CELECTA.

Xylophasia selecta, Wlk, xxxii, 646 (1865).

Calophasia lobifera, Moore, P. Z. S. 1881, p. 358.

Genus DELTA.

Type.

Delta, Saalm, Lep. Madag., p. 263 (1891) *stolifera*.

Trichorhiza, Hmps., Cat. Lep. Phal. B. M. v., p. 13 (1905). *peterseni*.

Proboscis fully developed; palpi obliquely porrect, reaching to just beyond frons, the 2nd joint rather broadly fringed with hair below, the 3rd short; frons smooth, with ridges of hair at middle and above; eyes large, round; antennæ of male ciliated; thorax clothed with hair and scales mixed, the

tegulae produced to a dorsal ridge above the thorax with divided ridge-like crest; tibiae fringed with long hair on outer side; abdomen with dorsal crests on basal segments. Forewing with the apex somewhat produced and acute, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

- A. Forewing with the reniform expanding below and extending to well below angle of cell *intermedia*.
 B. Forewing with the reniform small and not extending to below the cell *indica*.
 1941. DELTA INTERMEDIA.
 1803. DELTA INDICA.

Genus CHIRIPHA.

Type.

Chiripha, Wlk, ix, 200 (1859) *involuta*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately fringed with hair, the 3rd short; frons smooth, with ridge of hair above; eyes large, round; antennae of male bipectinate with short branches, the apex serrate; head and thorax clothed with hair and hairlike scales, the pro- and metathorax with spreading crest; tibiae moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex somewhat produced and acute, the termen obliquely curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1784. CHIRIPHA INVOLUTA.

Genus CALOGRAMMA.

Type.

Calogramma, Guen. Noct. i., p. 165 (1852) *festiva*.

1832. CALOGRAMMA FESTIVA.

Genus PRODENIA.

Type.

Prodenia, Guen. Noct. i., p. 159 (1815) *androgea*.

1829. PRODENIA LITURA.

Noctua litura, Fabr. Syst. Ent., p. 601 (1775).

„ *histrionica*, Fabr. Syst. Ent., p. 612 (1775).

„ *elata*, Fabr. Spec. Ins., ii, p. 220 (1781).

- Hadena littoralis*, Boisd. Faun. Ent., Mad, p. 91, pl. 13, f., 8 (1833).
 Moore, Lep. Ceyl. iii., p. 19, pl. 146, ff. i, a. b. ;
 Staud Cat. Lep. pal., p. 184.
 „ *retina*, Frr. Neue, Beitr. v., p. 161, pl. 478, ff. 2·3 (1846) ;
 Herr. Schaff. Eur. Schmett. Noct., ff. 144-5.
Prodenia tasmanica, Guen. Noct. i., p. 163 (1852).
 „ *ciligera*, Guen. Noct. i., p. 164 (1852).
 „ *testaceoides*, Guen. Noct. i, p. 165 (1852).
 „ *subterminalis*, Wlk., ix, 196 (1856).
 „ *glaucistriga*, Wlk., ix, 197 (1856).
 „ *declinata*, Wlk., xi, 723 (1857).
Mamestra albisparsa, Wlk., Journ. Linn. Soc. Zool. vi, p. 186 (1862).
Prodenia evanescens, Butl., Mem. Nat. Ac. Sci. Wash. Rep. Eclipse.
 Exp., p. 94 (1884).

Genus SPODOPOTERA.

Type.

Spodoptera, Guen. Noct. i, p. 153 (1852) *mauritica*.

Eulaphygma, Butl. Trans. Ent. Soc. 1890, p. 668 *abyssinia*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the prothorax without distinct crest, the metathorax with spreading crest; fore tibiæ broadly fringed with hair on outer side, the mid and hind tibiæ moderately fringed; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with short branches, the apex serrate.

1874. SPODOPOTERA PECTEN.

Spodoptera pecten, Guen. Noct. i., p. 155 (1852); Staud. Cat. Lep. pal. p. 195 (part).

„ *erica*, Butl. P. Z. S., 1880, p. 675.

Spælotis uniformis, Swinh., Trans. Ent. Soc. 1890, p. 226.

Caradrina pectinata, Hmps., Moths Ind. ii, p. 264 (1894).

Sect. II. (*Eulaphygma*).—Antennæ of male minutely serrate and fasciculate.

1831a. SPODOPOTERA ABYSSINIA.

Spodoptera abyssinia, Guen. Noct. 1, p. 154 (1852).

„ *cilium*, Guen. Noct. 1, p. 156 (1852).

- Caradrina latebrosa*, Led. Verz. Zool. Bot. Ges. Wien. 1855, p. 205. pl. 2. f., 11 ; Staud. Cat. Lep. pal. p. 195.
- „ *orbicularis*, Wlk., x., 294 (1856) ; Hmps. Nat. Hist. Sokotra, p. 323, pl. xx, f. 26.
- „ *præterita*, Wlk., x., 294 (1856).
- „ *insignata*, Wlk., x., 295 (1856).
- Laphygma procedens*, Wlk., xi., 721 (1857).
- Agrotis infixa*, Wlk. Journ. Linn. Soc. Zool. vi., p. 186 (1862).
- Laphygma obliterans*, Wlk., Trans. Ent. Soc. (3) 1, p. 87 (1862).
- Spodoptera insulsa*, Wlk., xxxii., 648 (1865).
- Laphygma imperviata*, Wlk., xxxii., 651 (1865).
- „ *retrahens*, Wlk., Entom. v., p. 126 (1870).

♂. Head and thorax ochreous suffused with red-brown ; palpi with black bands on 2nd and 3rd joints near extremities ; frons with lateral black bars ; tegulae with black medial line ; tarsi black ringed with white ; abdomen whitish dorsally suffused with brown. Forewing greyish suffused with brown ; subbasal line represented by double black striæ from costa and cell ; antemedial line double filled in with whitish, the inner line indistinct, oblique, waved ; orbicular whitish defined by black and with slight brown centre, oblique elliptical, open below and connected by a streak above median nervure with the reniform which is defined by black on inner side, its centre defined by diffused black ; an oblique dark striga from costa to reniform and waved line from lower angle of cell to inner margin, angled inwards in submedian fold ; postmedial line double filled in with whitish, the outer line indistinct, bent outward below costa, then minutely dentate, incurved below vein 4, some pale points with fuscous between them beyond it on costa ; subterminal line whitish defined on inner side by fuscous suffusion except between veins 7 and 5, and with slight dark streaks in the interspaces before it at middle, angled outward at vein 7, recurved and slightly waved at middle and angled inwards in submedian fold ; the terminal area tinged with fuscous ; a terminal series of small rather triangular black spots ; cilia whitish with a fuscous line near base and some fuscous at tips. Hindwing from semihyaline white ; the underside with the costa slightly irrorated with brown, a terminal veins of black points from apex to vein 2.

♀. Forewing with the orbicular completely defined by black, the reniform with fuscous centre and whitish annulus defined by black points on outer side ; hindwing with dark terminal line from apex to submedian fold and dark line through the cilia to vein 2.

Habitat.—SIERRA LEONE ; LAGOS ; NIGERIA ; EGYPT ; ARABIA ; ABYSSINIA ; SOKOTRA ; BR. E. AFRICA ; MASHONALAND ; NATAL ; CAPE COLONY ; MAURITIUS ; RODRIGUEZ ; SEYCHELLES ; ASIA MINOR ; SYRIA ; PALESTINE

PERSIA ; PUNJAB, Sultanpur ; SIKHIM ; BOMBAY, Bandra ; MADRAS ; Gooty ; PHILIPPINES ; BORNEO ; JAVA. *Exp.* 28-32 mill.

Larva.—Ochreous with numerous pale points defined by pale brown ; dorsal line orange ; subdorsal line represented by a series of orange marks defined by irregular black lunules above ; lateral line represented by orange marks, the stigmata black with brown patches above them ; head and thoracic plate red-brown.

Sect. III. (Spodoptera).—Antennæ of male ciliated ; fore tibiæ with very large tufts of hair and scales from outer side.

A. Hindwing semihyaline white *mauritica*.

B. Hindwing cupreous brown *postfusca*.

1831. SPODOPTERA MAURITIA insert (syn.)

Spodoptera acronyctoides. Guen. Noct. i., p. 154 (1852).

1868. SPODOPTERA POSTFUSCA.

Genus LAPHYGMA.

Type.

Laphygma, Guen. Noct. i, p. 156 (1852) *exigua*.

Proboscis fully developed ; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short ; frons smooth ; eyes large, round ; antennæ of male minutely serrate or ciliated ; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with spreading crest ; tibiæ moderately fringed with hair ; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and hardly crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from just below middle of discocellulars ; 6·7 from upper angle ; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate.

1829a. LAPHYGMA APERTURA.

Prodenia apertura, Wlk., xxxii, 654 (1865).

„ *synstictis*, Hmps., Moths Ind. iv, p. 511 (1896).

Sect. II.—Antennæ of male ciliated.

A. Forewing with the orbicular narrow, oblique elliptical *exempta*.

B. Forewing with the orbiculen round or slightly elliptical *exigua*.

1855a. LAPHYGMA EXEMPTA.

Agrotis exempta, Wlk., 355 (1856) ; Hmps., Cat. Lep. Phal. B. M. viii. p. 261, pl. 128, f. 24.

Prodenia bipars, Wlk., xi., 724 (1857).

„ *ingloria*, Wlk. xv., 1679 (1858).

♂. Head and thorax grey tinged with red-brown, the head and basal half of tegulæ browner; palpi with slight dark marks at sides of 2nd joint, tarsi brown ringed with white; abdomen ochreous tinged with brown. Forewing grey tinged with brown and suffused in parts with purplish red especially on costal half from medial to subterminal line; subbasal line represented by indistinct double dark striæ from costa and cell; an oblique black striga with some purplish red beyond it across submedian interspace before the antemedial line, which is double, rather oblique, waved, excurved in submedian interspace; claviform purplish red rather incompletely defined by black; orbicular grey tinged with olive brown and slightly defined by black, oblique elliptical and with pale bar beyond it; reniform slightly and incompletely defined by black and with a diffused blackish mark in centre; the median nervure and veins arising from it slightly streaked with white on medial area; traces of an oblique waved medial line from lower angle of cell to inner margin; postmedial line double, the outer line indistinct, bent outward below costa, then minutely waved, angled inwards in discal fold and incurved below vein 4, some pale points beyond it on costa; a diffused oblique whitish shade from apex to vein 6, the subterminal line arising from it, whitish, minutely waved, incurved below vein 3, with some wedge-shaped black streaks before it at middle, above and below vein 4 extending to postmedial line; a terminal series of slight black lunules; cilia greyish tinged with rufous and with slight rufous line near base. Hindwing ochreous white, the veins tinged with brown, the costal area and termen suffused with brown; a fine dark terminal line; cilia white; the underside with the costal area slightly irrorated with white, a terminal series of blackish points from apex to vein 2.

♀. Forewing more uniform fuscous brown, without the oblique pale bar beyond the orbicular.

Habitat.—GOLD COAST; LAGOS; NIGERIA; SUDAN; BR. E. AFRICA; MOZAMBIQUE; RHODESIA; TRANSVAAL; NATAL; ADEN; MADRAS, Palnis; CEYLON, Maskeliya, Haldamulla; SINGAPORE; QUEENSLAND; N. S. WALES; W. AUSTRALIA; HAWAII. *Exp.* 26-38 mill.

1855. LAPHYGMA EXIGUA.

Noctua exigua, Hubn. Eur. Schmett. Noct. f. 362 (1808); Dup. Lep. Fr. vi., p. 45, pl. 75, f. 2; Mill. Icones, pl. 75, f. 2; Staud. Cat. Lep. pal. p. 195.

„ *fulgens*, Geyer, Eur. Schmett. Noct., f. 796 (1833).

Caradrina pygmaea, Rmbr., Ann. Soc. Ent. Fr. 1834, p. 384, pl. 8, f. 2; Dup. Lep. Fr. Suppl. iii, p. 321, pl. 29, f. 5.

„ *junceti*, Zell. Isis. 1847, p. 455.

Laphygma cycloides, Guen. Noct. i., p. 157 (1852).

„ *caradrinoides*, Wlk., ix., 190 (1856).

Caradrina sebhana, Aust. Le Nat. 1880 p. 212.

„ *venosa*, Butl. Ent. Mo. Mag., xvii., p. 7 (1880).

Genus ANTHA.

Type.

- Anth*, Staud. Rom. Mem., vi, p. 448 (1892) *grata*.
Anodontodes, Hmps. Trans. Ent. Soc., 1895, p. 302; id.,
 Moths Ind., iv., p. 523 *rotunda*.
 A. Forewing with the orbicular present and with black
 patch above it on costa *grata*.
 B. Forewing with the orbicular absent and without black
 patch at middle of costa *rotunda*.

1805. ANTHA GRATA.

Leptina grata, Butl. Trans. Ent. Soc. 1881, p. 172; Staud. Cat.
 Lep. pal., p. 183.

Anth pretiosa, Staud. Rom. Mem., vi, p. 448, pl. 7, f. 6 (1892).

2192a. ANTHA ROTUNDA.

Genus AMPHIDRINA.

Type.

Amphidrina, Staud. Iris., iv, p. 293 (1892) *agratina*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the pro- and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen with some rough hair at base but without crests. Forewing with the apex rounded, the termen evenly curved, crenulate, veins 3 and 5 from near angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1864. AMPHIDRINA INTAMINATA.

Genus ATHETIS.

Type.

- Athetis*, Hubn. Verz., p. 209 (1827) *furvula*.
Atypha, Hubn. Verz., p. 213 (1827) *pulmonaris*.
Elaphria, Hubn. Verz., p. 230 (1827) *morpheus*.
Hapalotis, Hubn. Verz., p. 254 (1827) *gutvula*.
Nebrissa, Wlk., Journ. Linn. Soc. Zool., vi., p. 194 (1862) *bimacula*.
Anorthodes, Smith. Trans. Am. Ent. Soc. xviii., p. 114,
 (1891) *tarda*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with scales in front, the 3rd

short; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed with hair and hair-like scales mixed with some scales, the prothorax with small spreading crest, the metathorax without distinct crest; tibiæ moderately fringed with hair; abdomen without crests. Forewing rather narrow, the costa and inner margin subparallel, the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male serrate.

A. Forewing with the reniform present.

a. Forewing with series of dark points beyond postmedial line *externa.*

b. Forewing without series of dark points beyond postmedial line *cervina.*

B. Forewing with the reniform absent *castaneipars.*

1876. *ATHETIS EXTERNA.*

1802. *ATHETIS CERVINA.*

1883. *ATHETIS CASTANEIPARS.*

Sect. II.—Antennæ of male ciliated.

A. Forewing with the reniform with pale annulus.

a. Forewing with the reniform filled in with black.. *delecta.*

b. Forewing with the reniform not filled in with black.

*a*¹. Forewing with the reniform constricted at middle and angled inwards on median nervure *prætexta.*

*b*¹. Forewing with the reniform not constricted at middle or angled inwards on median nervure.

*a*². Hindwing uniform brown *divisa.*

*b*². Hindwing whitish tinged with brown especially on terminal area *ambigua.*

B. Forewing with the reniform defined by more or less prominent white points.

a. Hindwing wholly suffused with brown.

*a*¹. Forewing nearly uniform red-brown.

*a*². Forewing dark red-brown; antennæ of male minutely ciliated *interstincta.*

*b*². Forewing greyer; antennæ of male with long cilia *longiciliata.*

*b*¹. Forewing pale rufous or greyish variegated with deep rufous and brown *fasciata.*

- b.* Hindwing white, the terminal area suffused with brown.
- a*¹. Forewing with distinct black spot on costa at medial line.
- a*². Forewing grey faintly tinged with ochreous brown *bremusa*.
- b*². Forewing much more strongly tinged with ochreous brown *himalayica*.
- b*¹. Forewing without black spot on costa at medial line.
- a*². Forewing with dentate rufous marks before middle of subterminal line *fuscicornis*.
- b*². Forewing with slight fuscous shape before subterminal line.
- a*³. Forewing with the postmedial line excurved from below costa to vein 4.
- a*⁴. Forewing with slight yellowish spot on outer edge of reniform *obtusa*.
- b*⁴. Forewing with slight white spot on outer edge of reniform *sincera*.
- b*³. Forewing with the postmedial line straight from below costa to vein 4.
- a*⁴. Forewing with the antemedial line angled inwards on vein 1 *placida*.
- b*⁴. Forewing with the antemedial line not angled inwards on vein 1 *cognata*.
- C.* Forewing with the reniform not defined by white points.
- a.* Forewing with the reniform filled in with black... *bicornis*.
- b.* Forewing with the reniform not filled in with black.
- a*¹. Forewing with black spot on costa at medial line.
- a*². Forewing ochreous white irrorated with black, the lines with black spots on them *vicina*.
- b*². Forewing greyish ochreous largely suffused with fuscous, the lines indistinct, fuscous *flavitineta*.
- b*¹. Forewing without black spot on costa at medial line.
- a*². Forewing with the orbicular a small dark spot *stygia*.

- b². Forewing with the orbicular a black point. . . *bimacula*.
 c². Forewing with the orbicular absent . . . *variana*.

1860. *ATHETIS DELECTA*.

1887a. *ATHETIS PRÆTEXTA*.

Caradrina prætexta, Swinh., A. M. N. H. (7) xv., p. 152 (1905);
 Hmps. Cat. Lep. Phal. B. M. viii., p. 316, pl. 129, f. 23.

Head and thorax grey tinged with brown; palpi blackish at sides except at tips; tarsi blackish ringed with white; abdomen grey suffused with dark-brown, the anal tuft of male yellow. Forewing grey-white irrorated and in parts suffused with red-brown; subbasal line double filled in with whitish, waved, from costa to submedian fold; antemedial line double filled in with whitish, angled outwards below costa and excurved below submedian fold; orbicular, a black point defined by whitish; reniform chocolate brown with whitish annulus, constricted at middle and slightly angled inwards on median nervure; a waved dark medial shade; postmedial line double filled in with whitish, slightly bent outwards below costa, then produced to double black points on the veins, oblique below vein 4, some whitish points beyond it on costa; subterminal line whitish defined on inner side by red-brown, slightly angled outward below costa and excurved at middle; terminal area suffused with brown; a terminal series of black lunules slightly defined on inner side by whitish; cilia brown with a waved white line through them. Hindwing greyish suffused with brown; an indistinct discoidal lunule; a terminal series of slight dark lunules from apex to vein 2; cilia yellowish white with a brown line through them; greyish irrorated with brown, a large dark discoidal spot, minutely waved postmedial line, incurved below vein 2, traces of a subterminal band, and a terminal series of small black lunules.

Habitat.—ASSAM, Khasis. *Exp.* 32 mill.

1879. *ATHETIS DIVISA*.

1863. *ATHETIS AMBIGUA*.

Noctua ambigua, Schiff. Wien. Verz. p. 77 (1776); Fabr. Mant.
 Ins. ii., p. 148 (1787); Staud. Cat. Lép. pal. p. 197.
 „ *plantaginis*, Hübn., Eur. Schmett. Noct. f. 576 (1802); Dup.
 Lép. Fr. vi., p. 59, pl. 76, f. 2; Herr. Schäff.,
 Eur. Schmett. Noct. f. 381.

Orthosia uniformis, Swinh., Trans. Ent. Soc. 1885, p. 350, pl. 9, f. 6.
Caradrina hilaris, Staud. Cat. Lép. pal. p. 197 (1901).

1887b. *ATHETIS INTERSTINCTA*.

Graphiphora interstincta, Moore, Lep. Atk. p. 118 (1883); Hmps.,
 Cat. Lep. Phal. B. M. viii., p. 324, pl.
 129, f. 27.

Head and thorax red-brown mixed with grey, the head paler; palpi black-brown, greyish at tips; tarsi fuscous with pale rings; abdomen dark

reddish brown. Forewing deep red-brown, slightly tinged with grey and with slight dark irroration; subbasal line black, curved, from costa to submedian fold; antemedial line black, bent inwards to costa and excurved above inner margin; orbicular a black point; reniform chocolate brown, rather constricted at middle, with a white point at upper extremity and two at lower; a. diffused dark medial line, oblique from costa to lower angle of cell and angled inwards below the cell; postmedial line black, slightly bent outwards below costa, then with black points beyond it on the veins, excurved to vein 4, then oblique; submedial line faint, pale, defined on inner side by red-brown, excurved below vein 7 and at middle; a terminal series of minute dark lunules; a fine whitish line at base of cilia. Hindwing reddish brown tinged with grey; a fine whitish line at base of cilia; the underside whitish tinged with brown and irrorated with dark brown, a black discoidal spot, diffused curved postmedial line, and terminal series of small black lunules from apex to vein 2.

Habitat.—SIKHEM; BHUTAN. *Exp.* 36-40 mill.

1887c. *ATHETIS LONGICILIATA*.

Athetis longiciliata, Hmps., Cat. Lèp. Phal. B. M. viii., p. 324, pl. 129, f. 28 (1909).

Head and thorax rufous mixed with a few dark brown scales; palpi black at sides except at extremities of 2nd and 3rd joints; tarsi fuscous with pale rings; abdomen pale rufous suffused with fuscous except the anal tuft. Forewing rufous tinged with grey and slightly irrorated with brown; subbasal line blackish, angled outwards below costa and ending at submedian fold; antemedial line blackish, oblique to vein 1, then erect; orbicular a blackish point; reniform a narrow lunule defined by diffused rufous, and with slight whitish points round it; medial line brown, rather diffused, oblique from costa to lower angle of cell, then inwardly oblique and sinuous; postmedial line brown, excurved from costa to vein 4, then oblique, with traces of a series of dark points beyond it on the veins; subterminal line yellowish, defined on inner side by brown suffusion, slightly excurved below vein 7 and at middle; a terminal series of black points; cilia with a fine yellowish line at base. Hindwing red-brown tinged with fuscous; a diffused blackish discoidal spot; a terminal series of slight dark lunules; cilia with a fine yellowish line at base; the underside whitish irrorated with dark-brown, a black discoidal spot, rather diffused curved brown postmedial line, and terminal series of small black lunules from apex to vein 2.

Antennæ with the cilia rather long.

Habitat.—ASSAM, KHÁSIS. *Exp.* 36 mill.

1887. *ATHETIS FASCIATA*.

Graphiphora fasciata, Moore, P. Z. S., 1867, p. 54; Hmps., Cat. Lep. Phal. B. M., viii, p. 325, pl. 129, f. 29.

1857. *ATHETIS BREMUSA*.1856a. *ATHETIS HIMALEYICA*.

Caradrina himaleyica, Koll. Hügel's Kaschmir, iv., p. 479 (1844),
Hmps. Cat. Lep. Phal. B. M. viii., p. 335
pl. 130, f. 6.

„ *arenacea*, Moore, P. Z. S., 1881, p. 349.

Head, thorax and abdomen grey-white slightly irrorated with brown; palpi black, white at tips; antennæ blackish except at base; tarsi black ringed with white. Forewing grey-white slightly tinged and irrorated with brown; subbasal line represented by a small black spot on costa; antemedial line indistinctly double, minutely waved, oblique, with black spot on the outer line at costa; orbicular a brownish point; reniform a narrow lunule defined by rufous, with some fuscous at lower extremity, two white points on inner edge and three on outer and a rufous point beyond it at middle; medial line with black spot at costa, oblique to the reniform and sinuous from lower angle of cell to inner margin; postmedial line indistinct, with black spot at costa, bent outwards below costa, then minutely waved and with some black points beyond it on the veins, incurved below vein 4, some white points beyond it on costa with slight black streak between them; subterminal line whitish, defined on inner side by small somewhat dentate rufous marks, angled outwards at vein 7 and excurved at middle; the terminal area suffused with fuscous; a terminal series of minute black lunules; cilia with a fine whitish line at base. Hindwing white slightly tinged with reddish brown, especially on the veins and terminal area; cilia white; the underside with the costal and terminal areas irrorated with brown, a small discoidal spot, postmedial series of minute streaks on the veins, and terminal series of small black lunules.

Habitat.—W. CHINA; KASHMIR, Goorais Valley, Scinde Valley; PUNJAB, Kulu, Dalhousie, Dharmsala, Umballa; SIKHIM TIBET, Yatong; SIKHIM.
Exp. 32-36 mill.

1856. *ATHETIS FUSCICORNIS*.

Caradrina fuscicornis, Rmbr. Ann. Soc. Ent. Fr. 1832, p. 286, pl.
9, f. 5; Dup. Lèp. Fr. Suppl. iii. pl. 29, f.
4; Staud. Cat. Lep. pal., p. 196.

Noctua kadenii, Frr. Neue Beitr. Schmett. ii., p. 147, pl. 186 (1836);
Fisch. von. Rosl. Schmett., pl. 36, ff. 2.; a. b.;
Dup. Lèp. Fr. Suppl. iii., pl. 29, ff. 2, a. b.; Herr.
Schaff. Eur. Schmett. Noct. f. 408; Staud. Cat.
Lep. pal. p. 197.

Caradrina proxima, Rmbr. Faun. And. pl. 18, f. 7 (1839).

„ *variabilis*, Bell. Ann. Soc. Ent. Fr. 1865, p. 104, pl. 2
f. 1.

Cratadrina farinacea, Moore, P. Z. S., 1888, p. 411.

1861. *ATHETIS* OBTUSA.

1862. *ATHETIS* SINCERA.

1859a. *ATHETIS* PLACIDA.

Radinaera placida, Moore, Lep. Ceyl. iii. p. 30, pl. 147, f. 4 (1884).

Head, thorax and abdomen pale rufous mixed with greyish; palpi black, white at tips; antennæ black; tarsi black ringed with white. Forewing greyish suffused with rufous and with slight dark irroration; subbasal line slight, dark, curved, from costa to submedian fold; antemedial line very indistinct, oblique, sinuous; orbicular a black point; reniform indistinct diffused, blackish, constricted at middle, with an ochreous point on its outer edge and slight whitish points round it; traces of a dark medial line, oblique from costa to reniform and sinuous below the cell; postmedial line slight, blackish, bent outwards below costa, then minutely dentate, incurved below vein 4; subterminal line defined on inner side by blackish suffusion, minutely dentate, excurved below vein 7 and at middle; a terminal series of black striæ. Hindwing white, the apex slightly tinged with brown; the underside with the costal area tinged with ochreous, a dark discoidal point and postmedial points on the veins from costa to vein 4.

Habitat.—CEYLON. *Exp.* 26-30 mill.

1854. *ATHETIS* COGNATA.

1865. *ATHETIS* BICORNIS.

1859b. *ATHETIS* VICINA.

Cratadrina vicina Staud. Berl. Ent. Zeit., 1870, p. 118; Hmps. Cat. Lep. Phal. B. M., viii, p. 355, pl. 130, f. 28, Staud. Cat. Lep. pal., p. 196.

„ *belucha*, Swinh., Trans. Ent. Soc., 1885, p. 348, pl. 9, f. 2.

„ *syriaca* Staud. Iris. iv, p. 294 (1892).

„ *fergana* Staud. Iris. iv, p. 294 (1892).

♂. Head and thorax ochreous white slightly irrorated with red-brown; palpi with black-brown patch at side of 2nd joint; tarsi blackish ringed with white; abdomen white. Forewing yellowish white slightly irrorated with brown, the terminal area suffused with fuscous brown; subbasal line represented by black striæ from costa and median nervure; antemedial line blackish with black spot at costa, oblique, interrupted; orbicular a small round brown spot; reniform a small lunule defined by blackish; medial line with black spot at costa, oblique to reniform, slightly sinuous from cell to inner margin; postmedial line much interrupted, with small black spots at costa. Submedian fold and inner margin strongly bent outwards below costa, slightly incurved at discal fold, incurved below vein 4, some yellow points beyond it on costa; traces of a pale subterminal line, excurved below vein 7 and at middle; a terminal series of small black

lunules; cilia brownish with a fine pale line at base. Hindwing white, the veins of terminal area and termen slightly tinged with brown from apex to vein 2; a fine brown terminal line from apex to submedian fold; cilia tinged with brown at apex; the underside with small apical brownish patch and terminal series of small blackish lunules from apex to vein 2.

♀. Forewing with the terminal area hardly suffused with fuscous except before subterminal line.

ab. 1. Fergana. Forewing more distinctly marked but without the dark suffusion on terminal area . . . Armenia, W. Turkestan.

ab. 2. syriaca. Darker, the hindwing wholly tinged with fuscous . . . Asia Minor, Syria.

Habitat.—SPAIN; S. RUSSIA; ARMENIA; ASIA MINOR; SYRIA; PERSIA; W. TURKESTAN; E. TURKESTAN; BELUCHISTAN, Quetta. *Exp.* ♂ 30, ♀ 32 mill 1859c. *ATHETIS FLAVITINCTA.*

Athetis flavitincta, Hmps. Cat. Lep. Phal. B. M., viii., p. 356, pl. 130, f. 29 (1909).

Head and thorax whitish mixed with brownish ochreous; palpi blackish at sides; tarsi black ringed with white; abdomen pale red-brown. Forewing whitish tinged with reddish ochreous and irrorated with brown, the terminal area suffused with pale fuscous; subbasal line represented by a black point on costa; antemedial line indistinct, double, with black point on the outer line at costa, then oblique and slightly waved; orbicular absent; reniform narrow, faintly defined by fuscous; a diffused curved waved medial shade; postmedial line indistinct, double, with black point on the inner line at costa, slightly bent outwards below costa, then minutely dentate, oblique below vein 4, some pale points beyond it on costa; subterminal line indistinct, pale, minutely waved; cilia greyish ochreous mixed with brown and with fine ochreous line at base. Hindwing white tinged with brown, the veins and termen brown; cilia white with a brown line through them from apex to vein 2; the underside white, the costal area irrorated with brown, the termen suffused with brown from apex to vein 2.

Habitat—PUNJAB, Kulu, Sultanpur. *Exp.* 32 mill.

1859d. *ATHETIS STYGIA.*

Athetis stygia, Hmps. Cat. Lep., Phal. B. M., viii, p. 357, pl. 130, f. 30 (1909).

Head, thorax and abdomen brown mixed with grey; palpi blackish, whitish at tips; tarsi fuscous ringed with whitish. Forewing grey tinged with brown and thickly irrorated with dark-brown; subbasal line brown, curved from costa to submedian fold; antemedial line brown, angled outwards below costa, then obliquely excurved; orbicular a small round brown spot with faint pale annulus; reniform elongate elliptical, brown with a

faint pale annulus; a rather diffused dark medial line, oblique from costa to median nervure, then inwardly oblique; postmedial line indistinct dark, bent outwards below costa, then dentate and produced to dark points on the veins, incurved below vein 4, some pale points beyond it on costa; subterminal line whitish defined on inner side by red-brown, almost straight; a terminal series of slight black points. Hindwing grey suffused with brown; a terminal series of slight dark striæ; cilia with a fine whitish line at base; the underside whitish thickly irrorated with brown, a black discoidal lunule and rather diffused curved postmedial line.

Habitat.—PUNJAB, Kulu, Sultanpur, Simla, Dharmasala, Kalapani. *Exp.* 26-36. mill.

1857a. *ATHETIS BIMACULA*.

Nebrissa bimacula, Wlk., Journ. Linn. Soc. Zool. vi, p. 194 (1862);
Swinh., Cat. Het. Mus. Oxon. ii, p. 41, pl. 1,
f. 22.

Caradrina terminata, Hmps., J. Bom. Soc. Nat. Hist. xi, p.
444 (1897).

1881. *ATHETIS VARIANA*.

Genus HYPOPERIGEA.

Type.

Hypoperigea, Hmps., Cat. Lep. Phal. B. M., viii., p. 422

(1909) *tonza*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and rather broadly scaled, the 3rd moderate; frons with rather small truncate cornical prominence with slightly raised edges and corneous plate below it; eyes large, round; antennæ of male minutely serrate and ciliated, with a ridge of scaled between them; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with large white or pale patch at base.

a. Forewing with white or pale curved mark from
middle of costa to apex *albonotata*.

b. Forewing with obliquely placed white patches from
middle of costa to apex *leprostricta*.

B. Forewing without white or pale basal patch.

2024. *HYPOPERIGEA ALBONOTATA*.

Tatache albonotata, Hmps. n., Ill. Het. B. M. ix., p. 96, pl. 162, f. 22 (1893).

„ *plumbicula*, Hmps. n., J. Bomb. Nat. Soc. xvii., p. 475 (1906).

1717e. *HYPOPRIGEA LEPROSTICTA*.

1874b. *HYPOPRIGEA TURPIS*.

Acontia turpis, Wlk. xii, 794 (1857).

Caradrina discophora, Hmps. n., J. Bomb., Nat. Hist. Soc. xiv., p. 204 (1902).

Genus *DYSMILICHIA*.

Type.

Phalacra, Staud. Rom. Mém., vi., p. 568 (1892), Nec. Wlk.

Lep. 1866 *gemella*.

Milichia, Snell. Tijd. v. Ent., xli, p. 194 (1898), Nec.

Mieg. Dipt. 1830 *gemella*.

Dysmilichia, Speiser, Berl. Ent. Zeit., xlvii., p. 140 (1902). *gemella*.

Proboscis fully developed; palpi oblique, short, fringed with hair in front; frons with truncate conical prominence with raised edges and corneous plate below it; eyes large, round; antennæ of male typically ciliated; build slender; thorax clothed chiefly with scales and without crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing short and broad, the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1834a. *DYSMILICHIA CALAMISTRATA*.

Ilattia calamistrata, Moore, P. Z. S., 1881., p. 348; Hmps. n., Cat.

Lep. Phal. B. M., viii., p. 428, pl. 133, f. 12.

♀. Head and thorax rufous mixed with whitish; tarsi ringed with whitish; abdomen whitish suffused with rufous. Forewing deep rufous, a white point at base; subbasal line represented by a white point below costa; antemedial line represented by a white striga angled outwards below costa and white points on median nervure and vein 1; claviform absent; orbicular round, white defined by black; reniform figure-of-eight-shaped, with white annulus defined by black, interrupted at middle; post-medial line fine, rufous traversing a series of small elongate white spots defined by rufous, bent outwards below costa, then minutely waved, ex-curved to vein 4, then incurved, some white points beyond it on costa; subterminal line represented by white striæ from costa and inner margin, hardly traceable between those points, ex-curved below vein 7 and at middle; a terminal series of dark striæ; cilia with a slight dark line

through them. Hindwing whitish suffused with red-brown; the cilia white with a brown line near base and brown spots at tips; the underside whitish thickly irrorated with red-brown, a slight discoidal spot and curved diffused brown postmedial line.

Habitat.—SIKIM; ASSAM, KHÁSIS. *Exp.* 26-30 mill.

Genus PROXENUS.

Type.

Proxenus, Her. Schaff. Eur. Schmett. ii., p. 240 (1845) . . . *hospes*.

Radinogoes, Butl. Trans. Ent. Soc., 1886, p. 393 . . . *tenuis*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons, and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales and without crests, build slender; tibiæ moderately fringed with hair; abdomen without crests. Forewing long and narrow, the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell or shortly stalked; 5 obsolescent from middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

Sect. I. (Proxenus).—Mid and hind tibiæ of male with fringes of pale hair on outer side, abdomen with lateral fringes of pale hair on basal segments.

1889a. PROXENUS DISSIMILIS.

Proxenus dissimilis, Hmps., Cat. Lep. Phal. B. M., viii., p. 431 pl. 133, f. 15 (1909)

Head and thorax brown mixed with grey; palpi black at sides, whitish in front and at tips; mid and hind tibiæ of male fringed with whitish hair; abdomen grey suffused with brown, the basal segments in male with lateral fringes of white hair, the genital tufts whitish. Forewing glossy brown irrorated with grey and dark brown; traces of a double waved antemedial line; orbicular a dark point; reniform a small lunule slightly defined by brown; postmedial line indistinct, double, bent outwards below costa, then waved, incurved at discal fold and below vein 4, the veins beyond it with dark streak to the subterminal line, which is greyish defined on inner side by fuscous, angled outwards at vein 7 and excurved at middle; a terminal series of black points with whitish points between them. Hindwing white, the apical area and termen to vein 2 tinged with brown; cilia brown towards apex with a fine white line at base; the underside with the costal area irrorated with brown except at base, a slight discoidal point.

Habitat.—JAPAN; SIKIM, 1,800'; S. BORNEO; PHILIPPINES. *Exp.* 24-30 mill.

Sect. II. (*Radinogoes*).—Mid and hind tibiæ and abdomen of male normal.

1889*b*. *PROXENUS TRISTIS*.

Caradrina tristis, Brem. Lep. Ost. Sib., p. 49, pl. 5, f. 9 (1864);
Hmps., Cat. Lep. Phal., B. M., viii., p. 437,
pl. 133, f. 23; Staud., Cat. Lep. pal., p. 198.

Hydrilla lugens, Staud. Rom. Mem. vi., p. 490 (1892).

Head and thorax whitish suffused with pale brown; palpi whitish, fuscous at tips; tarsi with slight whitish rings; abdomen whitish tinged with brown. Forewing ochreous white suffused and irrorated with brown, the costal area whiter; subbasal line absent; faint traces of a waved antemedial line; orbicular represented by a small elongate black spot in cell, the reniform by minute black lunules on inner and outer sides; postmedial line very indistinct, bent outwards below costa, then dentate, incurved below vein 4; subterminal line absent; a terminal series of faint dark points. Hind-wing white, the veins tinged with brown; a fine brown terminal line; the underside with the costal area irrorated with brown.

Ab. 1. lugens. Dark.

Habitat.—E. SIBERIA; KASHMIR, Goorais Valley, Nubra. *Exp.* ♂ 30,
♀ 28 mill.

Genus STYGIATHETIS.

Type.

Stygiathetis, Hmps. Cat. Lep. Phal. B. M., viii., p. 444

(1909) *mus*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately fringed with hair in front, the 3rd long, oblique; frons with short truncate conical prominence with raised edges; eyes large, round; antennæ of male fasciculate; thorax clothed with long hair and hair-like scales and without crests; tibiæ fringed with rather long hair; abdomen clothed with rough hair and with lateral fringes of hair but without crests, the claspers large. Forewing narrow, the costa and inner margin subparallel, the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hind-wing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1888. *STYGIATHETIS MUS*.

(*To be continued.*)

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVII with Plate XVII.

(Continued from page 19 of this Volume.)

As already stated in a previous paper (No. XVI of this Series), the boas and pythons are grouped together in a single family (*Boidæ*). They agree in possessing rudimentary hind limbs, but the pythons are grouped together in a distinct sub-family (*Pythonnæ*) characterised by the presence of a bone (the supra-orbital) which contributes largely to the roof of the orbit. In the boas on the other hand the roof of the orbit is formed as in colubines, and most other snakes entirely by a lateral expansion of the frontal bone. The sub-family *Pythonnæ* comprises seven genera of which one only, *Python* is represented in our Indian Dominions.

The genus *Python* of which our Indian *molurus*, and the Papuan *amethystinus* are the types, includes nine species distributed in Africa (*sebae*, *anchietæ*, and *regius*), Malaya (*timorensis*, *reticulatus*, *curtus*), Australia (*spilotes*), Papuasias (*amethystinus*) and Asia (*molurus* and *reticulatus*). The two latter occur within Indian limits, and are dealt with in this paper.

Python molurus (LINNÉ).

THE INDIAN PYTHON.

History.—Pythons were well known to the ancients, and probably it was the Indian *molurus* among others with which they were acquainted. In scientific literature the first certain allusion to our common Indian species, is by Linné who described it under the name *Coluber molurus* in 1766. In 1796 Russell figured it no less than four times in his first volume (Plates XXII, XXIII, XXIV, and XXXIX).

Nomenclature (a) *Scientific*.—The name *Python* came into generic use in 1803, when Danderi associated this snake with that known to the ancients by this name.

The word *Python* seems to be derived from the Pythian Vale, in the mud of which the fabled monster of the Greeks was supposed to have been generated after the Deluge. Milton* refers to the event in the following terms:—

“ but still greatest he the midst.
Now dragon grown, larger than whom the Sun
Engendered in the Pythian vale on slime
Huge Python ; and his power no less he seemed
Above the rest still to retain.”

Dr. Brewer† says the word is derived from the Greek “*puthes-thai*” to rot, because the monster after being killed by Apollo was left to rot in the sun. The scene of the tragedy—Mount Parnassus—was immortalised by the erection of Delphi, the famous shrine of Apollo.

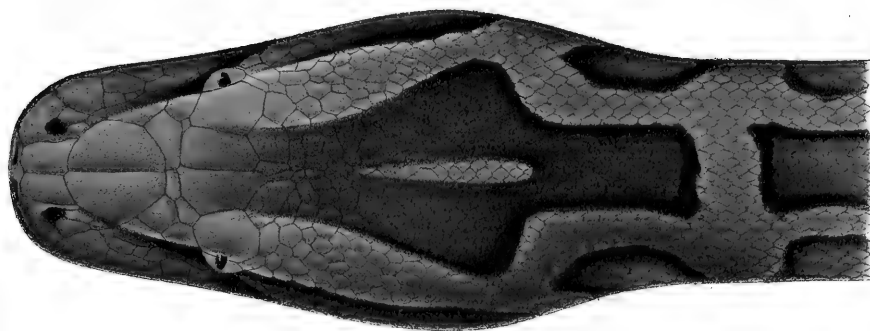
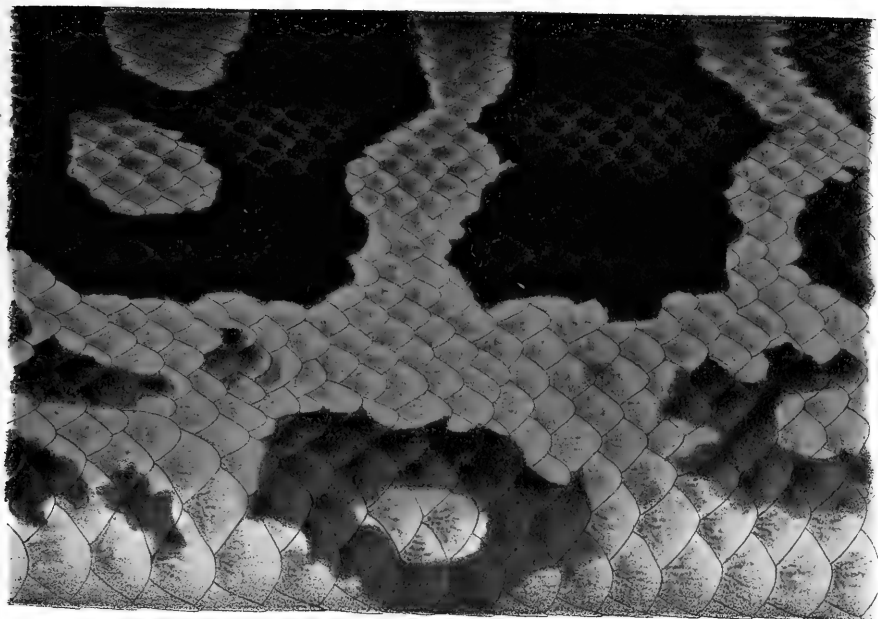
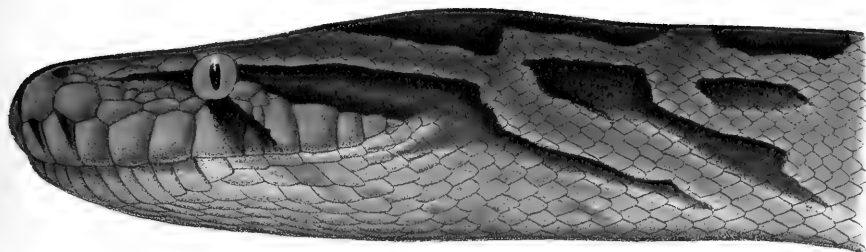
(b) *English*.—It is almost always known to the Anglo-Indian as the python, but sometimes is spoken of as the rock snake, by no means an appropriate name.

(c) *Vernacular*.—Throughout India it is pretty generally called “*ajgar*” the Hindustani for dragon, but has many other local names.

In Southern India it is frequently called by the Tamils “*periyā pamboo*” which simply means “large snake.” “*Malai pamboo*” or “hill snake” is also frequently in use by Tamils, and Father Bertrand, S.J., tells me in some parts the Tamils call it “*Kaloodai viriyan*” which means “ass viper.” Russell mentions “*pedda poda*” as the name it is known by in the Ganjam District. This, am informed, is the Telugu for “large strikers,” “*poda*” being the noun formed from the verb “*potu*” (pronounced more like “*podu*”) to strike. Father Higgin, S.J., though has it on good authority that the word is “*peda*” a head, and that “*pedda peda*” means “large head,” or “large serpent.” In Mysore the Canarese name is “*heba havoo*” (large snake), but spoken by a native

* *Paradise lost*, Book X, line 528. *et. seq.*

† The reader's handbook of allusions, etc.



J.G. del.

J. Green Chromo

THE COMMON INDIAN SNAKES. (Wall.)
Python molurus non poisonus, nat. size.

the words sound more like "hebbow." The Telugu name about the same part of India is "dasira pam" a very appropriate one for it, as the python bears on its head three light, often pinkish stripes exactly like the three white stripes of the Hindu caste mark worn on the forehead and called by them "dasira." I am told that about Cuddapah it is known as "condasella." "Conda" is the Telugu for rock. Russell mentions "bora" as one of its names but I think this is generally applied in Bengal to the Russell's viper and not this snake. The two species being of somewhat similar build are often confused not only by natives, but by Europeans too.

In Ceylon all recent authorities concur in stating that the Singhalese name for it is "prinbera." The famous John Ray* however says that the name "anaconda" is Singhalese, and not South American as one might suppose. His friend Dr. Tancred Robinson gave him a catalogue of the Indian snakes he had noted in the Leyden Museum. No. 8 on this list read as follows:—"8 serpens indicus bubalinus anacandaia Zeylonensibus, id est bubalorum aliorumque jumentorum membra conterens." Colonel Yule† says he can find no mention of the name anaconda in old South American literature, and suggests that it is derived from the Singhalese "anai" elephant, and "kondra" which vanquished. I have failed to get any confirmatory evidence on this subject from Ceylon.

The Burmese throughout their Province call it "Sa-ba-ohn."

In South China I heard it called "hiang-zo" meaning "aromatic snake," a name probably suggested by its cooking flesh, since it is very savoury fare according to Chinese ideas. Swinhoe‡ mentions the name "vang" which is in common use among the Chinese in the Island of Hainan.

General characters.—The python is an extraordinarily massively built snake, and its development perhaps the most remarkable character it exhibits. Its girth relative to its length considerably exceeds that of all other snakes, except its own close allies. The body is thickest in the middle, reduces perceptibly towards the

* Syn. animal-quad. et Serp. 1693, p. 332.

† Hobson Jobson.

‡ Nat. Hist. of Hainan, 1870.

head, and the anus. It is rounded in outline, smooth, and if the snake is in good condition glossy. The neck is distinct. The head is very distinctly flattened, has a remarkably long snout fully four times the length of the diameter of the eye in adults, and a faint indication of a *Canthus rostralis*. The nostrils are large, open, directed upwards and placed high on the snout. The eye is very small, with an iris finely sprinkled with gold, and a vertical pupil. The rostral shield and the two first supralabials are deeply pitted or furrowed, a peculiarity only seen in this genus among Indian snakes. What these depressions really are, it is difficult to say, but I have noticed in dissecting out skulls that very highly developed nerves run through foramina in the maxilla corresponding with these pits and appear to me to ramify subcutaneously in them. It would appear from this that they may be sensory organs. Beneath the chin is a longitudinal furrow, the mental groove. The tail is short and prehensile, tapering rapidly and is about one-seventh to one-eighth the total length of the snake. Above the anus on each side is a carved claw-like process, the termination of the rudimentary limb, and which is more highly developed in the male.

Colour and markings.—On the head these vary a good deal with age, and in all individuals vary much according to whether desquamation has been recently completed, or is impending. The ground colour is greyish, whitish, or yellowish in adults, and often a very pretty shade of pink, in the young especially. There is a dark streak from the nostril to the eye in the young which often is completely obliterated in later life. Behind the eye at all ages is a conspicuous, dark, oblique band to the gape, and a more or less conspicuous patch below the eye tending to become obscure with age. On the front part of the lower lip there is often some fine mottling. On the back of the head and the nape is a large lance-shaped mark bisected in the median line, but this often fades so much anteriorly in adults that the similitude to a lance is more or less effaced. The light bisecting band, together with similar light bands, one of which passes over each eye-brow—especially distinct in the young—are very suggestive of the “dasira” mark already alluded to under vernacular nomenclature.

Dorsally the body is greyish or yellowish, and bears a series of large, somewhat roughly quadrate, patches extending from the neck on to the tail. These patches which are centrally much the same colour as the ground are well defined outwardly, and broadly outlined with black or blackish, and it is here that those lovely bluish and amethystine hues are seen in certain lights which show off the snake to such advantage, and which many an artist in the Royal Academy has tried, with varying degrees of success, to depict. Outside this median series of marks is another small series of a similar character, and outside this again a third sometimes, much less regular and smaller and mixed up with a coarse mottling extending into the flanks. The underparts are dirty-whitish, or faintly yellow. Seen in the sun's rays the iridescent effects on the dorsal patches defy alike the author's powers of description and the painter's art of reproduction. Virgil's * description however of the snake that encircled the tomb of Anchises, and which Kennedy has so graphically rendered in English verse as follows, leaves no doubt, but that it is a python that is indicated, and as likely as not our Indian species *molurus*.

"Scarce had he said when from the shrined base a slippery snake trailed huge seven coils, in each seven folds; and circling tranquilly the tomb slid o'er the altar; dark blue streaks its back lit up, its scales a sheen of spotted gold as (when the sun shines opposite) the bow darts from the clouds a thousand varied hues."

"Circling tranquilly" and the comparison of its colours to that of the rainbow are so graphic that one feels Virgil must have seen a python moving with the sun glancing upon its scales.

Identification.—The Python is a very easy snake to identify. The pits in the first two † upper labials will serve to distinguish it from every other Indian species. Only one other has those pits at all and this is its ally *P. reticulatus* which has the first *three* or *four* shields pitted. In case the head has been too mutilated to be certain of this point, attention should be directed to the costals. There are only three Indian snakes with the rows exceeding 50 in midbody, viz., *Eryx johni*, *P. molurus*, and *P. reticulatus* which are

* Æneid Lib. V line 84, *et. seq.*

† Care must be taken not to count the pits on the foremost shield—the rostral.

easily separated by the number of ventral shields, i.e., from throat to vent. In *Eryx* they are 192 to 210, in *molurus* 242 to 265, and in *reticulatus* 297 to 330.

Dimensions.—It is difficult to say with certainty to what length the python may attain. It seems probable that many of the great lengths given by travellers and sportsmen were guessed at, and the snake not actually measured. The creature is very thick relatively to its length, perhaps three or four times the girth of a Russell's viper of similar length, and five or six times that of a dhaman (*Zamenis mucosus*). If a python's length were judged from its girth, the estimate would grossly exceed the real measurement.

Specimens of 10 feet are not very uncommon, as will be seen from the following records, and there is little doubt that it exceeds 20 feet. In this Journal * Ferguson records an 18 foot one from the Ashambu Hills, and Major Begbie † one of a similar length killed near Baksa Duars. Other specimens of like proportions have been recorded by the late D. Ferguson in Ceylon‡, and in the *Pioneer* from Rajshai (Rajapur).¶ I saw the skin of a specimen of the same length in the possession of Mr. A. M. Harry in Assam. Mr. Prince of the King's Own Shropshire Light Infantry shot a female in the United Provinces in 1906 which measured 18 feet 3 inches. In *Land and Water* (August 10th, 1866 or 67?) one is mentioned from Mussoorie of 18 feet 9 inches. Tennent** refers to a specimen brought him in Ceylon that taped 19 feet. Another reported of a similar length was encountered by Captain George and Mr. Delsuage when shooting in Ceylon. This was captured and brought to Colombo, and exhibited in 1885 when I saw it. Jerdon †† saw a 19 foot specimen killed in Travancore, and Dr. Elmes told me of one he shot in Assam (N. Lakhimpur District) of the same size. A specimen measuring 19 feet 2 inches in our Society's collection, shot by the late Maharajah of Cooch Behar

* Vol. X, page 69.

† Vol. XVII, page 1021.

‡ Rept. fauna, Ceylon, p. 22.

¶ 3rd July 1907

** Nat. His. of Ceylon, II, p. 153.

†† Journ. As. Soc., Bengal, XXII, p. 526.

in Assam was originally reported in this Journal * as a Malayan python (*P. reticulatus*). Captain Percival † says he saw one in Ceylon 22 feet long, and the specimen mentioned by John Ray, and stated by him to be in the Leyden Museum was, he states, 25 feet (I have not been able to get confirmation of this from Leyden, but notice that Dumeril and Bibron refer to one in that Institution 20 feet). Elliot ‡ claims that it grows to a length of 30 feet, and if this opinion were confirmed I think India could lay claim to the two largest species of the genus, for *reticulatus* is also reported to attain to a length of 30 feet. Within quite recent times (1905) a specimen of the latter in the possession of Mr. John Hagenbeck was, as far as could be ascertained, in life 28 feet. The African species *sebae* is also a very large reptile which is recorded up to 23 feet.

The weight of a python is remarkable, the specimen of *molurus* killed by the Maharajah of Cooch Behar, which measured over 19 feet, scaled 200 pounds (over 14 stone). Mr. John Hagenbeck's reticulated python just alluded to weighed 250 pounds.

Haunts.—For the most part the Indian python is a jungle inhabitant. It may be met with in the interior of the densest forest tracts, or in sparser forest growth such as that which clothes the rocky slopes of many low hills. Where jungle is not available it most usually attaches itself to rivers and jheels, especially the former. In jungle areas it is frequently observed in trees and at times at some considerable elevation aloft. It climbs stealthily but well, and having established itself in the branches secrets itself so well that it is no infrequent event for a monkey to come within striking distance, and forfeit its life. By means of its prehensile tail it is capable of suspending itself from branches, nearly all of its body remaining free, and there is no doubt that many an incautious animal comes within reach, and is victimised. Mr. Sharpe, D. S. P., in the Fyzabad District, told me in 1906 that he once climbed up into a banyan tree in dense jungle with his shikari, who told him that at that season when the fruit was

* Vol. XIII, p. 718.

† The Island of Ceylon, 1805, p. 311.

‡ Rept. Brit. Ass., 1870, Trans., p. 115.

ripening many animals especially deer visited these trees to eat the fallen fruit. After having been quiet for some time, he noticed close to him a movement in what he had up till then taken to be an aerial root, but which on closer inspection proved to be a python suspended by its tail, and evidently established there for the same purpose that had actuated the sportsman. I have heard of pythons quartering themselves in hollow trees, and frequenting those on which egrets and night herons roost, to which at night the pythons stealthily crept and successfully took toll of.

In water this snake is quite at home, in fact it might be considered semi-aquatic in habit. It swims deftly and strongly, when its inclination prompts such activity, but is often to be observed partially or wholly submerged near the bank of a river, or jheel. As in captivity, it will lie for hours showing nothing but the tip of its snout, which is pushed out to raise the nostrils above the surface, and permit breathing. It can remain beneath the water entirely for many minutes. Colonel Fife Cookson * says that observations were made at Regent's Park which showed that it could keep entirely submerged for half an hour. I asked the attendant at Cross' Menagerie in Liverpool some years ago to make special observations in this direction, and he told me later that one kept its head below the water for 11 minutes, and remained above 9 minutes subsequently before again retiring below. Another kept below 12 minutes, and another 15 minutes.

If only partially submerged in water in its native haunts it keeps so still that any part of the body exposed is likely to be taken for a branch or root. My informant at Cross' Menagerie also told me that one kept in its bath from Wednesday till Sunday of one week, and often the sloughing period is passed in their tanks, from which the snake emerges resplendent in its new attire.

It is evidently a thirsty reptile, and in consequence probably is often impelled towards water for this reason. The dam in Paris in 1841 after accomplishing her maternal duties, and successfully launching forth her brood, drank eagerly swallowing

* Tiger shooting in the Doon and Ulwar, p. 31.

some two tumblerfuls of water, and the young too were observed to slake their thirsts. In drinking it does not fill the mouth, and throw back the head like birds, nor does it protrude the tongue and lap, but puts its mouth to the water, and imbibes like a mammal, the gulping movements of the throat being plainly visible.

Occasionally the python has been reported at sea, but it is probable that it has drifted thence on a log, or in the current of a flooded river. It shows no special affection for the sea.

Habits.—In spite of its cat-like pupil the python is very much on the alert during the day time, and very frequently when encountered in its native haunts is found in the act of swallowing some animal captured in broad daylight. On the other hand it is frequently on the move at night, for on many occasions where it has entered a poultry run, its depredations have been committed under cover of darkness.

Its size, beauty, and placid disposition make it a welcome addition to the snake charmer's stock-in-trade, so that scarcely a member of the fraternity is without one. It is therefore in India a very familiar creature to everyone. The juggler produces his specimen with some ostentation from a bag or basket, seeking to impress the on-lookers, and he trades upon the public's natural fears, for if one comes forward too close to inspect the creature, it is more than likely that the owner affects the greatest alarm for his safety, as though to foster the belief already prevalent in the assembled throng that it is to him, and him only that the snake is a peacefully inclined and harmless creature.

The python in all parts of India where there is an attempt at a cold season hibernates, retiring for some months to any convenient retreat, a hollow tree, or hole in a bank, or, in the hills, any natural crypt or cave of convenient size. In Dibrugarh once I found one in February beneath a log on the banks of the Brahmaputra. It was extremely somnolent. Sometimes one hears of several congregating in the same retreat. In the *Pioneer* (19th February 1906) is an account of six pythons being discovered in a cavity in the bank of a stream in Mysore. One after another was seized and dragged out and all ranged between 10

and 12 feet in length. I have also read of a similar occurrence in the Himalayas, though I cannot now lay my hands on the reference. A python was observed in a cave, and the raconteur with his Gurkha orderlies succeeded in extricating several, three or four, if I can rely on my memory.

It seems to me remarkable that in Southern India the python does not hibernate in the Plains, at least Colonel Dawson tells me it does not in Travancore, and Dr. J. R. Henderson says it does not in Madras in captivity, yet in Bombay which can lay no better claim to a cold season, a specimen caged in our Society's rooms hibernated for some months. Phipson* made some very interesting observations on this specimen at this period. Between the 21st December and the 13th of April, a period of 113 days, the snake refused food, and remained in a very sluggish, sleepy condition. It was noticed that its temperature fell from 82°F. (which had previously been the normal) to 73°. Two rats eaten on the 21st December were retained undigested until the 28th of February when they were thrown up. On ordinary occasions in the hot weather it had been recorded that a similar meal took about 8 days to digest. Desquamation during these months of lowered vitality did not occur, an interval of nearly seven months elapsing between the sloughing periods, though in the rest of the year this process was observed four times.

The movements of the python are very laboured and slow, in fact its mode of progression cannot be called anything but a crawl. This I believe to be due to the very narrow limits of the ventral shields, to the extremity of which the ribs on which the creature moves are fixed. The ribs are in consequence very much bowed, and only about half the body breadth—the middle two-fourths—are supported, leaving one-fourth overlapping each side. During progression waves of motion can be seen beneath the skin following one another in quick succession, corresponding to the movement of the ribs beneath, and reminding one of a similar series of wave-like successions seen in the legs of centipedes and millipedes whilst in motion.

* *Jourl., Bomb. N. H. Soc., Vol. II, p. 166.*

Disposition.—Our Indian python is one of the most lethargic of snakes, and as such an uninteresting creature in the vivarium. In captivity it passes the day in lazy apathy, sometimes lying upon, or partially encircling the branch usually put into its cage, sometimes convoluted into a heap on the floor, or as frequently reclining partially or wholly immersed in its bath of water. In any of these attitudes it is familiar enough to every one who has visited the reptile house in our various zoological gardens. It is wont to lie for hours together without a movement in spite of the stream of spectators peering into its cage, and their repeated attempts usually in vain to rouse it to activity by drumming upon the glass, flourishing handkerchiefs, and other objects before it. This apathy many might suppose the outcome of a familiarity which breeds contempt even in animals that are naturally of a fierce disposition, but even in its natural haunts it seems to behave in very much the same way, exhibiting little if any timidity, rarely rousing itself seriously to escape, and even when attacked making no attempt to avenge offence or injury. It thus becomes an easy victim to those who seek to kill it, or an easy capture to those of a more courageous and venturesome spirit. Even the female that shows such unremitting devotion to her parental duty of incubation will suffer herself to be captured with her brood of eggs with little or no remonstrance. In Travancore in 1903 a 15 foot dam, with eggs as it proved on the verge of hatching, allowed herself to be boxed, and conveyed to Trivandrum without offering any resistance. Similarly in Balrampur Mr. Oakes told me that two large pythons, one a dam incubating eggs, were easily captured alive and brought in from the jungle, the female continuing her duties and successfully hatching out her eggs. Six to eight foot pythons have several times been brought in to me found basking on a log, or in a boat on the river. These seemingly allowed themselves to be captured by a couple of coolies with little or no attempt at escape, though nothing could have been easier than one wriggle and a plunge into the water. Father Dreckman met with one just under 20 pounds in weight when walking with a friend in jungle. It was seen leisurely crossing their path. His friend went for its tail, while Father Dreckman

negotiated the head, expecting a hard struggle, but except for an ineffectual snap at his face, the snake allowed its neck to be seized, and its head to be thrust into a bag, into which the rest of its body was unceremoniously huddled without remonstrance.

Strength.—It seems very strange that a creature possessing such a massive and muscular body and such gigantic strength that it can overpower a leopard with ease, does not show a more aggressive spirit. Few people who have not handled a python in life can have any conception of the strength at its command. A brother of mine in the Straits told me he had several times measured large pythons in life, and that it takes as many coolies as one can put in the length of the snake to hold it, and even then they were unable to straighten it properly. Buckland* relates an incident which happened off the Coast of Ceylon, where a python effected its "footing" on a ship lying at anchor. When captured it encircled a water butt on deck, and compressed this so violently that the staves were contracted so as to allow the middle hoops to fall on to the deck.

Food.—The python, as the following remarks will testify, is practically omnivorous. It feeds on mammals, birds and reptiles indiscriminately, but seems to prefer mammals of relatively large proportions.

Its courage and power may be estimated by the fact that it has been known to overcome and devour a full-grown leopard (*Felis pardus*), sustaining but trivial injuries in the encounter. Thus Major Begbie in this Journal† related the circumstances leading to the death of a python by coolies, which subsequent dissection showed had eaten a leopard measuring 4 feet 2 inches from nose to rump. The snake was 18 feet long, and except for seven claw cuts appeared to have escaped unhurt.

Encounters with tigers also occur, but in the only instances known to me, the snake had the worst of it. Whether it was the aggressor in these contests it is impossible to know. Mr. Inverarity‡ after killing a tiger found some 2 feet 3 inches of the tail

* Curiosities of Nat. Hist., p. 182.

† Vol. XVII, p. 1021.

‡ The Great Thirst Land, p. 147.

end of a python in the stomach. Another proof of a similar encounter is through Professor Von Linston * who found a tapeworm taken from the intestine of a tiger killed in the United Provinces, was of a species known to inhabit the python, which it must previously have eaten.

Many are the records of its having eaten deer. Jerdon† mentions one having eaten a cheetal (*Cervus axis*). Dr. Elmes told me that he saw a hog deer (*C. porcinus*), cut out of a python killed by a neighbour, and the horns he thought must have been fully a foot long. The 18 footer that Mr. Harry had killed on his estate in Assam had swallowed a barking deer whose horns were four inches or more long. Mr. Copeland had a 15 foot snake killed on his estate while I was in Assam, which was proved to have swallowed a hog deer.

The Rev. Cortets, S.J., wrote to me of a sambur fawn (*C. unicolor*) being devoured whilst the dam stood by helpless. Tennent mentions a chevrotain (*Tragulus meminna*) being eaten by one in Ceylon. Colonel Channer‡ recorded one in this Journal that had killed a langur monkey which lay in its coil at the time of encounter. The snake proved to be 12 feet 10 inches long. The attendant at Cross's Menagerie in Liverpool told me that one of their pythons got loose, and ate a monkey with the collar and chain that were attached to it, on which account probably it disgorged its meal some two days later. In the *Pioneer* of the 13th July 1907, an 18 foot python, killed at Raj Shahi, was found to have eaten a jackal (*Canis aureus*).

In the Philosophical Transactions¶, a gentleman is reported to have found a snake on an Island near Bombay lying dead with the quills of a porcupine (*Hystrix leucura*) sticking out through its ribs. We may assume that the snake was a python, as no other Indian species could swallow such an animal. I have also seen masses of porcupine quills that had passed in the dung of pythons. These softened by the digestive juices had been matted into

* Ind. Mus. Rec. II, pt. 1, p. 108.

† Jourl. As. Soc. Bengal, XXII, p. 526.

‡ Vol. IX, p. 491.

¶ Vol. XLIII, 1744, p. 371.

masses which were hard to unravel, the quills having regained their texture after drying.

In *The Field* of 21st December 1907, Mr. Thwaites relates having seen a python in Ceylon spring at a hare (*Lepus nigricollis*) that was racing by. Ferguson in this Journal* reports an 8 footer at Quilon that had killed a kid.

Birds are frequently preyed upon by this snake. Mr. Thwaites† mentions a peacock in the coils of a python in Ceylon, and Colonel Evans‡ knew one in Burma eat a pheasant (*Gennæus lineatus*). One when I was in Dibrugarh was killed in the act of swallowing a chicken. Mr. Staunton killed one in Assam that had swallowed three of his ducks, and another made an unwelcome visit to Dr. Elmes' fowl-house, accounting for five ducks, four fowls, and one pigeon of his stock, all of which had been swallowed, giving the snake a beaded appearance. Dr. Elmes shot another which he saw lying in a bhil (lake) and found the following in its stomach:—two large and two small water rats, and two or three toads. Reptiles sometimes furnish the repast. Mr. Millard in this Journal¶ records one in our Society's rooms swallowing a monitor lizard (*Varanus bengalensis*), a rat, and two frogs in quick succession. In its native jungles it sometimes comes into conflict with other large snakes, for Mr. Donaghey told me that coming back to camp one day in Burma his coolies produced two snakes which they said they had discovered fighting, and which they killed. These proved to be a *Python molurus*, and a hamadryad (*Naja bungarus*). They reported that the python had closed its jaws on the hamadryad and secured it fast. I saw and examined the two skins. The hamadryad measured 10 feet 3½ inches, and the python 7 feet 11 inches. In the former skin at the junction of the middle and the posterior third was a rent 3½ inches long corresponding to the python's grasp. It is impossible of course to surmise which was the aggressor in the fight, but the python though smaller was giving a good account of itself.

The most curious meal that I have had reported to me was a double handful of earthworms, and a handful of the berry called

* Vol. X, p. 69, † *The Field*, 21st December 1907.

‡ Bom. N. H. Jourl. Vol. XVI, p. 520. ¶ Vol. XVI, p. 757.

by natives "jaman". My informant was Mr. J. H. Mitchell, a planter in Assam.

In captivity the python usually eats heartily and frequently, accepting anything that is offered, as the following annual bills of fare will show :—Phipson* says one in Bombay ate 23 rats, 3 hens, 3 crows, and 1 kestrel. One in Madras† ate 82 jerboas, but would not touch house rats; another ate 59 jerboas, 8 squirrels and 2 quails; a third accounted for 37 rats, 21 squirrels and 3 quails.

In Travancore one ate a spotted deer and 11 fowls; another 1 nilghai fawn, 1 hare, 1 rabbit, 13 fowls, and 1 pond heron; a third ate 14 fowls and 1 crown pigeon; a fourth 2 dogs, 2 hare wallabies, 2 bandicoots, and 54 fowls, a fifth 4 bandicoots, 19 fowls, and 1 spotted dove, and a sixth 1 hare wallaby, 1 bandicoot and 15 fowls.‡

It not infrequently happens that where two are caged together both strike at the same animal, and begin to shallow from opposite ends till their noses meet, when if one does not relinquish its hold, one gets its jaws over the other and swallows its mate. This happened once in Regent's Park and once in our Society's Rooms¶ when both struck at the same partridge, and similar occurrences have been reported in other institutions where snakes are kept.

The young which hatched out in Travancore are reported to have eaten the rats offered to them.

One sometimes hears of human beings being swallowed by pythons, but though I have collected several instances of other large snakes overcoming men I have no authentic instance of this snake doing so, but it is amply capable of overpowering the strongest man. A young European told me once in Hong Kong that he had witnessed as a boy with his brothers, a large snake (almost certainly a *molurus*) swallow a Chinese baby on Stone Cutter's Island in the Harbour. The mother left the child while engaged in some work, and the boys were afraid to encounter so formidable

* Jourl. B. N. H. S. Vol. II, p. 166. † Kindly communicated to me by Dr. J. R. Henderson.

‡ For this information I am indebted to Colonel F. W. Dawson.

¶ Jourl. Bomb. N. H. S. Vol. XIV, p. 395.

a snake. Major Sealy of the 4th Gurkhas tells me that a reliable old Gurkha Officer told him that once when officiating at a funeral pyre, a python emerged from the water hard by, seized the corpse, and made off with it.

Usually in captivity live animals have until recently been given to the snakes in various Zoological gardens, but now that it is known that pythons among other snakes will accept dead food, the order has changed. The fact that they would eat dead animals was noted 15 years ago in this Journal by Ferguson* who says "they will eat a dead rat, or rabbit, just as readily as a live one." He further states that under these circumstances it makes no attempt to constrict, but proceeds to swallow at once. In Regent's Park for some years now, many of the snakes have been fed entirely on dead animals.† Dr. Chalmers Mitchell, who paid special attention to this, says it was not noticed that it made any difference whether the food was freshly killed, warm, or bleeding, or if dead for sometime. It was noticed that in many cases the prey was not taken until night, and this was particularly the case when pythons took large animals like goats. He further states that the pythons showed their readiness to feed by special restlessness and activity, often leaving the tanks in which they have been lying previously, and that they are specially alert when they hear movements in the passage behind their cages, or when the back door are moved, and in the words of the keeper "they are asking for food.†"

The habit of constricting is characteristic of the whole family—boas and pythons alike. The snake, roused to activity by the sight of food, advances towards its prey often with quivering tail and makes a sudden dash at it with open jaws, which are no sooner closed upon its victim than it throws a coil or two—according to the size of the quarry—round it, holding it as in a vice until its struggles have completely ceased when it relaxes its embrace and proceeds to swallow it almost always beginning at the head. Dr. Chalmers Mitchell says "there appears to be no special attempt to crush the prey, to suffocate it or to break its bones." I

* Vol. X, p. 69.

† Dr. Chalmers Mitchell, P.Z.S., 1907, p. 785, *et seq.*

certainly agree that there is no attempt to crush with the intention of breaking bones, and so making the mass more easy to deal with, but if the victim is not suffocated how is it killed? My belief is that the vigour of the embrace is such that the victim's chest is incapable of expansion, and asphyxia results, or what amounts to the same thing the heart cannot beat against the pressure to which it is subjected.

In swallowing a small animal the mouth is widely opened, and the jaws fixed beyond the head of the victim which is easily engulfed. Prior to the actual seizure of the head, the python plays about over it with quivering tongue. It does not slaver over it as is commonly supposed, but the saliva flowing freely under the stimulus of food wets that part which has been received in the mouth, so that if the victim has been disadvantageously seized, and the snake rejects it to make a second attempt, the part of the quarry previously ingested is coated with saliva.

When the animal is large, the snake seizing the head strives to fix its teeth as far back as possible over the victim, when, having got a firm purchase, the jaws—six in all and all moveable—work alternately over the head, one or more at a time relaxing their hold to be pushed further forward and obtain an extended purchase while the others retain the hold already gained. The process is sometimes a tardy one, and if so the snake is frequently observed to protrude its wind pipe, so that an inch or even two may be seen beyond the mouth, beneath the mass that is engaged within the jaws. This extension of the glottis is however not a peculiarity confined to the python, for it has been noticed in several other snakes, colubrines and vipers.

It is popularly supposed that after a large meal, the python lies torpid, in a condition of satiety, until digestion has far advanced. I very much doubt if this is the true explanation of the disinclination of the snake to move under such circumstances, a disinclination even greater than it displays at other times. I think it is much more likely that in many cases the snake is so distended that it is afraid to move on account of internal injuries it may receive in the attempt. Undoubtedly accidents do occur which must end fatally. In the case already referred to where a dead

snake was found, with the quills of a porcupine it had devoured, penetrating its flanks between the ribs, it is probable that the injuries were received whilst moving before the quills had softened under the influence of the digestive function. A python already referred to, which was killed by Mr. Copeland's coolies in Assam, refused to move from its refuge in the jungle though surrounded by a howling mob of coolies. After sometime, the sustained apathy it exhibited stimulated the courage of the men who advanced by degrees nearer and nearer till they actually probed it with sticks and bamboos, and made the situation so untenable that the snake was forced to bestir itself. In trying to get away the horns of a hog deer, which it had swallowed, penetrated its flanks. It was finally despatched, and measured 15 feet. The horns of the deer were about 7 or 8 inches long. Such accidents are not very uncommon in snakes of all kinds—from over-distension, or from mechanical causes, the beak of birds, claws of various animals, etc.,—and I have collected quite a number of incidents of the kind.

The old traveller's stories of pythons, boas, etc., swallowing stags is not borne out by modern observations. I doubt if a python ever kills any deer with horns it is not capable of swallowing. If it does then sooner or later it has to relinquish its victim. The old books that led one to believe that the stag was swallowed up to its antlers, which projected from the mouth, and remained *in situ* till the head rotted off certainly misled us. The only way in which the body could be retained, and the head rejected would be by a slow decomposition (not a digestive process) separating the head at the neck joint, a process that would probably take several weeks to accomplish, and would exhaust even a python's patience. The body of a stag in such a position would not reach the stomach, and would not be subjected to any digestive action, for the saliva is inert to animal tissues. Further I doubt whether the lung could fulfil its function satisfactorily even with the small oxygen requirements of a snake, when subjected to the great and continued pressure of a carcass like a stag's.

The digestive powers of a python depend naturally on its general health. Phipson found that in the hot weather in captivity

small creatures like rats and crows were completely digested in about 8 days. McLeod* mentions a goat with horns being swallowed that took 3 weeks to digest.

In a vigorous snake every part of the animal swallowed is completely digested except epithelial structures such as hair, feathers, quills, teeth, the beak and claws, the scales of reptiles, the cornea, or, in snakes, the disc before the eye which is the analogue of the eyelids in other animals. If the dung is inspected these structures will be found massed together, and often retaining in a wonderful degree the relationship occupied in the animal ingested. In sickly snakes, or in those whose vitality is impaired, when hibernation is approaching, bones will be found passed in a more or less imperfectly digested state. In the excrement also may be seen circular spaces which are believed to be casts from the snake's intestine. Similar spaces were observed in the coprolites, or fossilised dung of the old reptilian monsters—*ichthyosaurus* and *plesiosaurus*—by Buckland, who remarks upon them in his *Bridgewater Treatise*.

Mr. Kinnear tells me they are frequently asked by visitors to our Society's rooms, if pythons reject the horns of deer and stags eaten. I cannot speak positively upon this point, which however is one that could easily be demonstrated in our Society's rooms using goats as victims. I have never heard it suggested that they disgorge the horns, but this is one of the many points touched upon in this paper about which I feel many of our readers could give more satisfactory information than my limited experience permits me to dilate upon. I believe however that the horns like other epithelial appendages are passed intact in the dung.

Though we have shown that the python as a rule feeds well in captivity, sometimes it will refuse food for long periods, and without suffering perceptibly. Ferguson† records one that fasted for over a year in the Trivandrum Gardens, but changed its skin more than once, and always looked glossy and in perfect health. After this fast it ate a white rat, and later again two more.

* The Voyage of H. M. S. "Alceste."

† Jourl. Bomb. N. H. Soc., Vol. VI., p. 424.

Uses.—In the arts, the skin of the python, in common with the skins of other snakes and lizards, is made up in various ways, as reticules, purses, letter cases, etc., but for trade purposes it is but sparingly used owing to the difficulty in procuring skins in any quantity. Nearly all large specimens are skinned by those who kill them, the skins being retained as trophies which one frequently sees adorning the walls of bungalows in this country. Sometimes these are cut up, and I have more than once seen belts made of them.

All through the East certain natives regard the flesh of this snake very highly, and I can quite believe that it may be excellent. The traveller D'Albertis when in New Guinea shot a closely allied snake to the python (*Liosis albertisii*) 19 foot long, which he tasted when the natives with him had cooked it for their own purposes. He said that it was "not so bad" though tough and too sweet, but pronounces the soup made from it as excellent. Only recently it was reported in the papers that at a fashionable dinner in Paris, as a novelty, python steaks were served and reported "very good." In Southern China I know it is eaten as a great delicacy. In Burma the Karens and Burmese both regard it as excellent fare, and no python met by them is likely to be spared for this reason. In Travancore Colonel Dawson tells me the hillmen eat the snake and its eggs too. In *Land and Water* (August 10th, 1867) a correspondent says that a gipsy tribe in the Dun eat pythons, and Mr. Mackinnon tells me that there is a tribe called Myhras inhabiting the Dun that are ophiophagous. Many Indian people are snake-eaters, and as such are not likely to disdain the flesh of the python. Such are the Santhals, who occupy a strip of country between the Ganges and the River Baitarani, the Oraons or Dhangars, and Kols of Chota Nagpur, the Garos of the Garo Hills, Assam, the Nats, a nomadic gipsy caste, the Chentsus of the Nallamalley Hills, the Kanjars of the United Provinces, and according to a Mr. Edwin, who wrote to a London paper in 1768, the Ceylonese too, and doubtless there are many others.

These same races attribute all sorts of virtues to the internal organs and fat. The specimen shot on its eggs near Colombo

Mr. Jausz told me had all its fat carefully collected for use in cuts and abrasions, sprains, etc. Colonel Dawson tells me that in Travancore the fat is used locally for sprains, fractures, bruises and rheumatism, and internally for leprosy. In Burma the gall bladder is prized, and its contents used medicinally.

Breeding (a) season.—From what is known of the period of gestation, and the season when eggs are deposited, the mating season is in December, January and February, the coldest months of the year when we know that the python, at any rate in Northern India, is hibernating. We have already seen the effect on the vitality of the snake during this period, which is reduced to the extent that the body heat is sensibly diminished, and the capability for digestion lost. Under the circumstances it is most remarkable that the inclination for sexual indulgence is retained, and yet this conclusion is in perfect agreement with that observed by me in other snakes that hibernate. One must assume that pythons retire in pairs, and that the female is gravid when the term of hibernation is spent. In Paris in 1841 the pair that mated were observed "in copula" several times during the month of January and February and eggs were deposited in May, *i.e.*, the season when eggs are laid in India.

Period of gestation.—From the foregoing it will be seen that the period from mating to the deposition of eggs is about 3 or 4 months.

Our Indian python is oviparous* and lays from 8 to 100 eggs, 107 being the largest brood I have any knowledge of. These are discharged in the hot months, March, April, May and June. The eggs are usually described as being the size of goose eggs, but the only accurate measurement I have been able to procure is from the Director of the Berlin Aquarium who tells me they are 12 c. m. \times 6 c. m. ($4\frac{3}{4} \times 2\frac{1}{8}$ inches), no doubt they vary somewhat. They are white in colour, soft, and equally domed at the poles.

After deposition the female coils herself around them, and has been observed so in captivity, and in a state of nature. As far as

*The African species *regius* is viviparous.

I am aware she appears to be generally alone during this period, I have only once heard of her mate being seen anywhere near her, and I have several records of pythons found lying up with eggs in jungle and being killed; and with one exception no mention has been made of another snake being found close at hand. The eggs are laid sometimes more or less in the open, the dam proving rather a conspicuous object to the shikari. Sometimes the female retires into a hole in a tree, beneath a fallen tree or in a termite's nest, one in the latter situation having been found near Colombo some years ago. Several interesting observations have been made during the period of incubation. The dam's temperature during the event, which happened in Regent's Park in 1881, was recorded several times, and compared with that of a male in an adjoining cage. It was always rather higher being about 10° - 4 to 30° Fahrenheit in excess of the male.* In this case the female having once settled herself around the egg remained there for six weeks without taking food, only leaving the eggs once for a few hours. In Paris too in 1841 it was reported that the dam refused food and drink during the whole period which lasted 58 days. When the young were hatching she drank about two tumblers of water. Her task accomplished it was noted that she took little or no notice of the young brood.

Period of incubation.—Though several pythons have laid eggs in captivity, in various Institutions, the eggs have frequently been sterile, or when fertile for some cause have failed to hatch. In Paris however in 1841 the incubation was brought to a successful conclusion, the period being 58 days. The 15 eggs were laid on the 6th of May, and on the 3rd of July eight hatchlings emerged out of the nine fertile eggs. (Günther, Rept. Brit. Ind., p. 330. I have seen it stated elsewhere on the authority of Dumeril that one hatched on the 3rd July, and eight more during the next four days.)

* P. Z. S. 1881, p. 960.

Young.—The hatchlings referred to already, acquired in Travancore, measured on an average 2 feet 5 inches.* In Regent's Park in 1881, the eggs which had been incubated for six weeks were found to be decomposing, and the contained embryos were then 11 inches long. The young hatched in Paris in 1841 are reported to have sloughed in from 10 to 14 days, prior to which they refused all food.

Growth.—The Travancore brood, it is reported, grew 11 inches in 4 months, and it would appear from this that growth in early life is more rapid than later, for Colonel Pollock† states that a specimen he had that was 12 feet long when he got it, grew about 3 feet in 2 years. The smallest incubating or gravid female with which I am acquainted was 11 feet long. This was shot on her eggs in April 1903 near Colombo, and I measured the skin which was in the possession of a Eurasian lad, an enthusiastic collector and lover of snakes. It is difficult to say precisely at what age this length would be attained, but I estimate that the snake would be beginning its sixth year. I find that most snakes double their length in the first year of life, so that a specimen $2\frac{1}{2}$ feet when hatched would be 5 feet at the end of the first year. If one allows a growth of 3 feet for 2 years, the rate given above by Colonel Pollock, 11 feet, would be attained at the end of the 5th year of life. A specimen in Regent's Park was 12 feet long when her eggs were laid. After maturity considerable growth continues for some years in most cases, but in captivity some examples grow little if at all after acquiring a length of 12 feet or less. Thus a specimen captive in Travancore for 12 years 9 months measured but $9\frac{1}{2}$ feet when it died.§

Age.—Very few records seem to have been made of this interesting matter. Gunther however mentions a python attaining the age of 19 years in Regent's Park. It was 4 years old when acquired, and lived a further period of 15 years in captivity. The various breeding events known to me are tabulated as fol-

* *The Field*, 3rd October 1903.

† Sporting days in Southern India, p. 223.

§ *The Field*, 16th March 1904.

lows, but I have been most unfortunate in failing to get details of many events I applied for to the various Institutions concerned.

Year and locality.	No. of Eggs.	Month observed.	Length of dam.	Remarks and Authority.
Paris 1841	15	May	?	Observed "in copula" several times in January and February. Eggs deposited 6th May, 9 hatched, 8 on 3rd July (Günther, p. 330).
Regent's Park 1881	about 20	June	about 12'	Eggs deposited 5th and 6th June. On July 18th embryos 11 inches long (P. Z. S. 1881, p. 960).
Madras 1901	8	..	..	My informant Dr. J. R. Henderson.
Colombo 1903	60	April	11'	Found in termite's nest. I examined the skin.
Trivandrum 1903	40	..	15'	Found in jungle. Eggs hatched, the young averaging 2 ft. 5 inches. (<i>The Field</i> , 3rd October 1903).
Balrampur, U. Provinces.	107	Hot season	?	Two found at close quarters, ♂ and ♀ both caged. Eggs hatched. (My informant Mr. M. H. Oakes, D.S.P.)
Manchester 1904	53 or 54	April	14'-2"	Dam obtained from Calcutta, Eggs laid 5th April, non-fertile. (<i>The Field</i> 30th April 1904, and 11th June 1904)
U. Provinces 1906	50 to 100	March	18'-3"	Found in jungle on 7th March. (My informant Mr. Prince, K.S.L. Infantry. I saw and measured the skin).
Terai.	?	May	?	Found in open jungle. (My informant Mr. Campbell, Commissioner, U. P.).

Sloughing—Many observations have been made in various quarters on this function, which appears to depend upon the general state of health and vital activities of the snake. I have already remarked upon the great reduction in temperature observed by Phipson in a python in our Society's rooms, during the period of hibernation, and with the vitality reduced to such

a low ebb that the snake was incapable of digesting its food, it is not surprising that there was a coincident abeyance in the disquamative process during this period. Specimens in Madras, and Travancore disquamated during the whole year, and appear not to have hibernated. In India the python sloughs five or six times annually as will be seen from the following table of records :—

Year of Observation.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	Authority.
1886-87.	27	..	17	..	27	..	..	..	..	..	..	10	..	..	..	Phipson, Journal Bom. N. H. S. II, p. 166.
1895-96.	..	26	..	..	..	18	..	..	..	19	..	..	..	..	..	..	..	Report, Madras Mus. 1896-97.
1896-97.	..	12	..	..	2	..	..	..	..	17	..	..	..	..	..	..	..	Do.
1897-98.	..	6	..	..	..	12	..	..	21	..	..	6	..	..	..	..	..	Do.
1900-01.	22	..	..	28	..	..	4	..	29	..	..	..	Trivandrum. Col. Dawson in epistola.
1900-01.	..	30	..	..	26	..	..	..	..	..	..	..	..	..	..	..	..	Do.
1901-02.	*	..	3	..	1	..	22	..	10	Do.
1901-02.	8	..	2	..	21	..	23	..	6	..	Do.
1902-03.	22	..	9	..	17	..	6	..	1	..	2	..	Do.
1902-03.	14	..	..	26	..	19	..	8	..	9	..	Do.
1902-03.	20	..	15	..	..	13	..	16	..	13	..	..	Do.
1909-10.	19	..	12	..	3	..	24	..	..	..	..	..	2	..	30	..	..	Millard, in epistola

* Date uncertain.

Parasites.—The python like most of its kind harbours many parasites, among which are :—

(1) A cestode or tapeworm (*Bothridium pythonis*) which may be found in great numbers in the intestine (duodenum), either free or attached to the mucous membrane. Professor Shipley found these in a specimen taken at Neligatta, Ceylon.*

* Spol : Zeylanica, Vol. 1, page 49.

(2) A cestode (*Solenophorus megacephalus*). Von Linstow † found this parasite once in the intestine of a tiger killed in the United Provinces, which proved that the carnivore had recently devoured a python.

(3) A nematode or round worm (*Ascaris attenuata*) which inhabits the intestine. These were found by Von Linstow ‡ in a python from the United Provinces.

(4) A nematode referred dubiously by Professor Shipley ¶ to *Ascaris rubicunda*. This was found in the left lung of a Ceylon python.

(5) A linguatulid (*Pooccephalus moniliformis*) also found by Shipley § in the lung of a Ceylon python.

(6) Captain Patton, I.M.S., tells me that in Southern India he has frequently found the python infested with ticks (*Aponomma geryasi*) which fix themselves to the skin between the scales.

In addition to the entozoa and ectozoa above referred to, this snake harbours—

(7) A blood parasite (*Haemogregarina pococki*) discovered by Sambon inhabiting the red blood cells. || The intestinal parasites may become a serious detriment to the health of their host, and even cost the snake its life as shown by Ferguson. ** He says at one time all the pythons in one cage in the Trivandrum Gardens, Travancore, died, and showed on *post-mortem* examination that they were infested with round worms which in many instances had perforated the walls of the stomach and intestines.

Fables.—I have already under nomenclature referred to the Grecian fable of its antochthonous origin.

Dr. Percival in his book on Ceylon (p. 303) says that the python is reputed by the Singhalese to vanquish tigers, buffaloes and even elephants, and it may be this fable that originated the name “anaconda,” which, as stated under nomenclature, appears to be a Ceylon word.

† Ind. Mus. Records, Vol. II, Pt. 1, page 108.

‡ Loc. cit. p. 109.

¶ Loc. cit.

§ Loc. cit.

|| P. Z. S., 1907, p. 283.

** Bombay N. H. Jourl. Vol. X, p. 69.

Tennent* tells me that the Singhalese say that when it has devoured a meal of uncomfortable proportions, it will drag itself through two closely adjacent trees with the object of crushing the contained mass. I put this down as a myth, because a great distension is in itself prone to tax the abdomen to its bursting power, and under such circumstances trifling mechanical agencies would still further jeopardise the integrity of the tissues.

Dr. Davy † says that the Singhalese believe that the "pimbera" when young was a *tic polonga* (Russell's viper) and had poisonous fangs, but at a certain age it loses these, acquires spurs (rudimentary limbs), and is then metamorphosed into a python. They suppose further that the "spurs" are poisonous, and it uses them in striking its prey. Another belief is that the dam twists her abdomen during parturition, and the males have then to seek and mate with female *noyas*, as though there were no other females of their own kind with which to mate! *Noyas* I take to be *nagas* or *cobras*. Such a belief seems curious in face of the fact which must be known to them, one would suppose, that the female incubates her eggs. Colonel Dawson tells me that in Travancore the natives believe so in the efficacy of the fat of the python as a healing agent, that they affirm that if a snake is cut in pieces, the application of the fat to the raw parts effects an immediate reunion of them.

Distribution.—Ceylon, Peninsula India from Cape Comorin to the Himalayas, Assam, Burma, but though apparently not inhabiting Indo-China re-appears in South China, the Malay Peninsula and Java.

Its exact limits in North-West India are uncertain, but Murray records it from Sind (*Joongshai*, *Jerruck*) and the Punjab. Many of our members should be able to give us information as to whether it occurs in Kashmir. It seems probable that the Indus demarcates its limits in this part of India.

Whilst occurring plentifully in Burma, it is not known from the Andaman-Nicobar Insular group. As regards the Malayan Penin-

* Nat. Hist. of Ceylon, p. 304.

† An Account of the Interior of Ceylon, p. 82.

sula and Java further evidence of a confirmatory nature seems desirable, since Flower (Journl. As. Soc. Bengal 1899, p. 655) reminds us of what is very true, *viz.*, that *mohurus* is found in localities outside its natural range, often being carried thence by itinerant Indian jugglers. He records seeing one in Bankok which enquiry elicited had come with a conjurer from India. Pythons too are accidentally transported in ships occasionally to regions far removed from their natural haunts. It is far commoner I think in the plains than in the hills, but ascends to altitudes up to about 6,000 feet in the Himalayas, and other Indian ranges.

Lepidosis.—*Rostral* much broader than high; in contact with 6 shields, the sutures made with the internasal decidedly shortest; impressed with two elongate furrows or pits parallel to and just below the superior borders.

Internasals.—A pair, the suture between them two-thirds to three-fourths that between the præfrontal fellows. *Præfrontals* a pair, separated from the frontal by a transverse series of small scales.* *Frontal*—Divided longitudinally, as large or rather smaller than the præfrontals. *Supraoculars*.—Rather shorter than the frontal, rather broader than each frontal half. *Parietals*.—None, the frontal being succeeded by small scales. *Nasals*.—In contact with 1st and 2nd labials. *Loreal region* occupied by many scales. Eye surrounded by many scales hardly deserving the name of præoculars, postoculars, etc.

Supralabials 10 to 13, the anterior 2 deeply pitted as shown in our Plate. Sometimes one (usually the 6th) touches the eye. *Infralabials* 18 to 22. Usually some of the anterior and posterior are indented with small roundish depressions, but those may be entirely absent. *Sublinguals* absent, the mental groove being bordered by 5 or 6 small scales. *Costals* two heads-lengths behind heads 54 to 56; in midbody 61 to 75; two heads-lengths before vent 43 to 45. On the back the scales are longer than broad, but in the flanks they enlarge till in the last 2 rows the breadth exceeds the length. The last row is just one-half the breadth of

* This is a curious departure from the usual colubrine arrangement of head shielding but is also seen in the snake *Zamenis diadema*.

the ventrals. *Ventrals*—242 to 269, narrow, occupying about the middle third of the belly. *Anal*—Entire, as broad as the ventrals; *Subcaudals* 60 to 72 in pairs. Russell had a specimen which he figures (Pl. xxxix, Vol. i.) in which 36 pairs were succeeded by 28 entire shields, and these by 3 more pairs.

Dentition.—*Præmaxillary* 4 small teeth, a pair on each side widely separated in the median line. *Maxillary* 18 to 19. The 2nd to 6th or 8th longest, subequal, the rest gradually decreasing in length. All more or less obliquely set with points directed inwards, the posterior almost transverse. *Palatine* 6, first 4 subequal, and as long as maxillary, last 2 progressively decreasing. All strongly inclined inwards. *Pterygoid* 8 to 10, about as large as the posterior maxillary, strongly inclined inwards. *Mandibular* 16 to 19, the 2nd to 6th or 8th longest and subequal, the subsequent teeth progressively diminishing. Strongly inclined inwards, the posterior being almost transverse.

Our Plate is in every way excellent, Mr. Green having in this surpassed all his previous good work.

(To be continued.)

A MONOGRAPH OF THE WASPS OF THE GENUS *CERCERIS* INHABITING BRITISH INDIA.

WITH NOTES ON OTHER ASIATIC SPECIES

BY

ROWLAND E. TURNER, F.Z.S., F.E.S.

So much collecting has been done in India, and so many new species described since the publication of Colonel Bingham's volume on Aculeate Hymenoptera in 1897, that I think a further revision of some of the genera may be useful. In few genera has the list of Indian species been more increased than in *Cerceris*, owing to the extensive collections made by Colonel Nurse and Mr. Comber near the Baluchistan Frontier. The result, owing chiefly to the Quetta collection, is the inclusion of a number of Palearctic species in the fauna of British India, the mountainous regions of the North-West Frontier being really part of the Palearctic region. From a study of Colonel Nurse's collection it seems to me that the Palearctic species of *Cerceris* have reached Quetta by two routes, firstly through Europe and Turkestan, and secondly from North Africa by way of Southern Arabia and Baluchistan. To the first line belong *C. emarginata*, Panz., and *C. funerea*, Costa; to the second *C. pulchella*, Klug., and *C. pruinosa*, Morice. Few of the species, if any, seem to be identical with those from S. W. Persia. At Karachi on the other hand the species are mainly Indian, or in a few cases representative of, but not identical with, Palearctic species; many species are common to Karachi and Deesa, and doubtless belong to the fauna of the Rajputana region. As Bingham had very little material from N. W. India, the number of species of *Cerceris* given in his work (24), is almost trebled in the present paper.

I have thought it best to give short descriptions of all the species known to me, as much too little space is given to details of structure in Bingham's work, and Cameron's descriptions are very scattered and not convenient for reference, and also very uneven in quality. Colour seems to be an especially plastic

character in this genus. In series of insects showing peculiar local colouration, species of *Cerceris* are included. In hot desert regions the usual black ground colour tends to disappear either through the extension of pale yellow markings or by the substitution of a pale ferruginous colour. This is the case to a great extent in the neighbourhood of Karachi and to a lesser degree at Quetta; the same character also appears in Egypt and Turkestan. In the wet regions of Assam and Burma the black ground colour is retained, but the usual yellow markings are replaced in a number of species by a dull brick red. In the Shillong district species of *Cerceris*, *Crabro*, *Odynerus*, *Eumenes*, *Coelioxys* and a saw-fly which I have not been able to identify were all influenced in this manner. In Tibet at a high elevation the usual yellow markings tend to be replaced by creamy white, *Cerceris*, *Odynerus*, and an allied species of saw-fly being again affected. In Australia also the prevalent orange colour is shown in the same genera, with the exception of the saw-fly, and also in other genera of *Eumenidae*, more rarely in species of *Sphecoidea* of other genera. But in all countries the extent of the colour in *Cerceris* is subject to much local variation, and any key to the species in which colour is used extensively must be unsatisfactory. I have therefore based my key on that given by Schletterer for the Palæarctic species of the group, in which structural characters are used as the basis, and have also thought it well to add several plates, which will explain the shape of the clypeus and pygidial area in different species better than can be done in words.

My thanks are due to Colonel Nurse, Mr. Comber and Mr. O. S. Wickwar for the supply of specimens for this paper. I have also been able to make use of the Rothney collection, now in the Oxford museum, containing many of Cameron's types, through the kindness of Professor Poulton; and also the National Collection at South Kensington, which contains Smith's and Bingham's types. Mr. Bainbrigge Fletcher has also sent the collection of the genus from the Pusa collection to me for examination.

I have not described species from the male sex, considering that as a rule it is inadvisable in this genus to make the male the type of a new species. In my key to the males it should be remembered

that in some species the sculpture of the enclosed area at the base of the median segment is subject to considerable variation.

Key to the Indian species of *Cerceris*.

FEMALES.

1. ♀♀. Cheeks with a stout spine 2
 Cheeks without a spine 4
2. Clypeus flat; pygidial area much narrowed to the apex; the spine on the cheeks very long and stout *C. inexorabilis* Turn.
 Clypeus not flat; pygidial area only slightly narrowed to the apex; the spine on the cheeks short or of moderate length 3
3. Clypeus slightly concave; the spine on the cheeks moderately long *C. ephippium* Turn.
 Clypeus slightly convex; the spine on the cheeks short *C. fletcheri* Turn.
4. Sides of ventral segments 3-5 with erect plates; fifth ventral segment recurved at the apex, with a triangular tooth in the middle *C. mastogaster* Sm.
 Ventral segments without lateral erect plates; fifth ventral segment not recurved and without a median tooth 5
5. Fifth ventral segment produced at each of the apical angles into a stout, blunt tooth *C. funerea* Costa, var *pallidopicta* Rad.
 Fifth ventral segment not produced into a tooth at the angles 6
6. Second ventral segment with a raised area at the base 7
 Second ventral segment without a raised area at the base 30
7. Clypeus with a free lamina springing from the base *C. violaceipennis* Cam.
 Clypeus without a free lamina or with the extreme apical margin only free 8
8. Mesopleuræ tuberculate or spinose 9
 Mesopleuræ without tubercles 12
9. Mesopleuræ with two well defined tubercles .. 10
 Mesopleuræ with only one well defined tubercle. 11

10. The two tubercles on the mesopleuræ close together, another very indistinct above the intermediate coxæ *C. dentata* Cam.
The tubercles far apart, the one above the intermediate coxæ acute and bent forward . . . *C. quettaensis* Cam.
11. Clypeus convex, with a narrow triangular truncation from below the middle to the apex . . . *C. pulchella* Klug.
Clypeus flattened, the apical half subconcave . . . *C. spectabilis* Rad.
12. Clypeus truncate at the apex 13
Clypeus more or less emarginate at the apex 23
13. Lamina of the clypeus free at the apex . . . *C. melaina* Turn.
Clypeus without a free lamina at the apex 14
14. Clypeus subconcave from the base 15
Clypeus not subconcave at the base 16
15. Clypeus with a strongly impressed transverse line before the apex *C. comberi* Turn.
Clypeus without an impressed line *C. albopicta* Sm.
16. Clypeus slightly convex, not impressed on the apical half, with a minute tooth on each side at the apex *C. boysi* Turn.
Clypeus impressed on the apical half or above, the apex not toothed 17
17. Enclosed area at the base of the median segment longitudinally striated from base to apex *C. fortinata* Cam.
Enclosed area otherwise sculptured 18
18. Clypeus narrowed towards the apex, the truncated margin not measuring more than half the length of the clypeus *C. novaræ* Sauss.
The truncated margin of the clypeus measuring much more than half the length of the clypeus 19
19. Second ventral segment rather sparsely but evenly punctured, not smooth in the middle on the apical portion 20
Second ventral segment smooth in the middle on the apical portion 21
20. Petiole broader than long, not narrowed at the apex *C. protea* Turn.
Petiole as long as broad, narrowed at the apex. *C. compta* Turn.
21. Clypeus impressed from above the middle to the apex; petiole much broader than long . . . *C. rybiensis* Linn.
Clypeus not impressed above the middle; petiole not much, if at all broader than wide. 22

22. Apical half of clypeus distinctly concave ;
enclosed area of median segment finely
punctured, with oblique striæ in the corners... *C. wickwari* Turn.
Apical half of clypeus flat, not concave ; enclos-
ed area of median segment longitudinally
striated on the basal half *C. emarginata*
Panz.
23. Lamina of the clypeus slightly porrect and
free at the extreme apex 24
Lamina of the clypeus not porrect or free at the
apex 28
24. Basal area of the median segment very coarsely
longitudinally striated *C. vischnu* Cam.
Basal area of the median segment not striated.. 25
25. The emargination of the clypeus wide and
shallow, not angular 26
The emargination of the clypeus angular .. 27
26. Basal area of the median segment sparsely
punctured ; pygidial area elongate ovate, as
narrow at the base as at the apex *C. tristis* Cam.
Basal area of the median segment smooth,
striated on the margins ; pygidial area much
broader at the base than at the apex .. *C. opulenta* Turn.
27. Abdomen as coarsely punctured as the thorax.. *C. belli* Turn.
Abdomen less coarsely punctured than the
thorax *C. pulchra* Cam.
28. Basal area of median segment smooth and
shining ; clypeus very widely and shallowly
emarginate on the whole breadth, the angles
produced *C. pruinosa* Morice
Basal area of median segment striated ; the
emargination of the clypeus not extending
over the whole breadth 29
29. The emargination of the clypeus rather wide,
produced into an obtuse tooth on each side.. *C. instabilis* Sm.
The emargination of the clypeus reduced to a
narrow incision with a tooth on each side .. *C. abuensis* Turn.
30. Clypeus with the lamina more or less free .. 31
Clypeus without a free lamina 42
31. The lamina of the clypeus free from the base.. 32
The lamina free only from the middle or below. 38
32. Mesopleuræ tuberculate 33
Mesopleuræ not tuberculate 34

33. Lamina much broadened from the base; very
widely and deeply emarginate. *C. orientalis* Sm.
Lamina not broadened from the base, shallowly
emarginate *C. saussurei* Rad.
var.
chrysothemis Turn.
34. Enclosed area at the base of median segment
smooth and shining 35
Enclosed area longitudinally rugose or striated 37
35. Enclosed area of the median segment with a
deep median groove; pygidial area much
broader at the base than at the apex *C. agnata* Turn.
Enclosed area with the median groove almost
obsolete; pygidial area much broader at the
apex than at the base 36
36. Lamina of clypeus widened from the base,
broader at apex than long, shallowly emarginate *C. humbertiana* Sauss.
Lamina truncate at apex, no broader than long,
not widened from the base *C. flavopicta* Sm.
37. Lamina broadly incised almost to the base;
enclosed area of the median segment longitudinally rugose *C. acuta* Rad.
Lamina shallowly and widely emarginate; enclosed area longitudinally striated *C. hilaris* Sm.
38. Lamina free from the middle or slightly below;
mesopleuræ not tuberculate 39
Lamina free at the apex only; mesopleuræ tuberculate *C. elizabethæ* Bingham.
39. Clypeus below the lamina more or less dentate
at the apex 40
Clypeus below the lamina truncate at the apex,
the lamina truncate *C. flavoplagiata* Cam.
40. The lamina in the form of a thickened porrect
tubercle, feebly incised at the apex *C. pentadonta* Cam.
The lamina of the usual flattened form 41
41. Lamina truncate; two teeth on each side on
apical margin of clypeus *C. latibalteata* Cam.
Lamina slightly emarginate; three teeth at
apex of clypeus *C. specifica* Turn.

42. Clypeus with several teeth on the apical margin 43
 Clypeus without teeth on the apical margin 46
43. The teeth four or five in number, well defined, not very small 44
 The four teeth almost obsolete, very minute *C. rothneyi* Cam.
44. First abdominal segment about twice as long as broad *C. kirbyi* Bingham.
 First abdominal segment nearly twice as broad as long 45
45. Closely punctured; the clypeus narrowed to the apex *C. downesivora* Turn.
 Less closely punctured; clypeus not narrowed at the apex *C. tetradonta* Cam.
46. Clypeus widely and deeply emarginate 47
 Clypeus not at all or only very shallowly emarginate 49
47. Mesopleuræ tuberculate; enclosed area of the median segment finely and closely punctured. *C. nebulosa* Cam.
 Mesopleuræ not tuberculate; enclosed area not punctured 48
48. Enclosed area of median segment longitudinally striated *C. binghami* Turn.
 Enclosed area smooth and shining *C. wroughtoni* Cam.
49. Clypeus strongly convex 50
 Clypeus very feebly convex or flat 51
50. Clypeus produced into a beak-like prominence just before the apex *C. rhyncophora* Turn.
- Clypeus with a margined groove from near the middle widening slightly to the apex *C. fastidiosa* Turn.
51. Mesopleuræ distinctly tuberculate 52
 Mesopleuræ not at all or very indistinctly tuberculate 53
52. Apical margins of the clypeus recurved and narrowly produced in the middle *C. vigilans* Sm.
 Apical margin of the clypeus truncate *C. baluchistanensis* Cam.
53. Clypeus truncate at the apex 54
 Clypeus very shallowly emarginate at the apex 56

54. Enclosed area of the median segment longitudinally striated *C. leucozonica* Schlett.
Enclosed area of the median segment not striated on the whole surface 55
55. Enclosed area of the median segment smooth and shining *C. nursei* Turn.]
Enclosed area of the median segment striated at the base, punctured at the apex *C. circumcincta* Turn.
56. Enclosed area of the median segment smooth and shining; mesopleuræ very indistinctly tuberculate *C. mellicula* Turn.
Enclosed area of the median segment shining, with large scattered punctures; mesopleuræ not tuberculate *C. bolanica* Turn.

♂♂.

MALES.

1. Second ventral segment with a raised area at the base 2
Second ventral segments without a raised area at the base 18
2. Sixth ventral segment with a small tooth on each side at the apical angles *C. abuensis* Turn.
Sixth ventral segment without a tooth 3
3. Mesopleuræ distinctly tuberculate *C. quettensis* Cam.
Mesopleuræ not tuberculate 4
4. Clypeus broadly rounded at the apex 5
Clypeus truncate at the apex 8
5. Clypeus with four minute teeth at the apex *C. instabilis* Sm.
Clypeus without teeth 6
6. Enclosed area of the median segment coarsely longitudinally striated *C. vischnu* Cam.
Enclosed area of the median segment smooth or punctured 7
7. Enclosed area of the median segment rather sparsely punctured *C. pulchra* Cam.
Enclosed area of the median segment smooth and shining, with a few striæ at the apex *C. novaræ* Sauss.
8. Second ventral segment evenly punctured, except on the raised basal area *C. albopicta* Sm.
Second ventral segment not evenly punctured, usually smooth in the middle 9

9. Enclosed area of the median segment more or less striated 10
 Enclosed area of the median segment not striated 13
10. Enclosed area striated in the angles only, or with very short striæ on the sides 11
 Enclosed area striated beyond the angles .. 12
11. Enclosed area striated in the angles, punctured in the middle and at the apex; petiole black; punctures not very deep *C. emarginata* Panz.
 Enclosed area striated in the angles and with very short striæ at the sides; the middle smooth and shining; petiole red; punctures very deep *C. wickwari* Turn.
12. Enclosed area entirely longitudinally striated; puncturation of the abdomen coarse and close. *C. fortunata* Cam.
 Enclosed area not striated at apex; puncturation less coarse and close *C. rybiensis* Linn.
13. Enclosed area of the median segments smooth and shining 14
 Enclosed area of the median segment punctured 16
14. First abdominal segment red, almost twice as long as broad *C. comberi* Turn.
 First abdominal segment black and yellow, only a little longer than broad 15
15. Basal area of the second ventral segment very strongly raised; the wings infuscated on the whole apical margin *C. pulchella* Klug.
 Basal area of second ventral segment not strongly raised; wings clouded at the apex only *C. spectabilis* Rad.
16. Enclosed area of the median segment very finely and closely punctured *C. violaceipennis* Cam.
 Enclosed area not finely or closely punctured. 17
17. Enclosed area shining, sparsely and not coarsely punctured; petiole longer than broad .. *C. tristis* Cam.
 Enclosed area coarsely punctured, petiole broader than long *C. protea* Turn.
18. Sixth ventral segment with a long spine at the apical angles 19
 Sixth ventral segment without spines 20

19. Fifth ventral segment with a spine at the apical angles *C. hilaris* Sm.
(*himalayensis* Bingh.)
- Fifth ventral segment without spines *C. mellicula* Turn.
20. Petiole slender, more than three times as long as broad 21
- Petiole never more than twice as long as broad 22
21. Median segment strongly punctured *C. basimacula* Cam.
- Median segment finely and sparsely punctured. *C. lepcha* Cam
22. Clypeus armed with a row of teeth at the apex. 23
- Clypeus without teeth 26
23. Petiole longer than broad; the teeth of the clypeus minute *C. wroughtoni* Cam.
- Petiole broader than long.. .. . 24
24. Apical joints of the flagellum longer than the penultimate, and strongly curved, abdomen mostly ferruginous *C. vigilans* Sm.
- Apical joint of the flagellum no longer than the penultimate; abdomen black and yellow, rarely ferruginous on the petiole 25
25. Enclosed area of the median segment shining, with a median groove, more or less obscurely punctured; teeth of the clypeus very small.. *C. rhyncophora* Turn.
- Enclosed area of the median segment smooth and shining, without a median groove; teeth of the clypeus not very small *C. humbertiana* Sauss.
26. Mesopleuræ tuberculate 27
- Mesopleuræ not tuberculate 28
27. Petiole longer than broad *C. bimaculata* Cam.
- Petiole broader than long *C. nebulosa* Cam
28. Clypeus strongly concave *C. nursei* Turn.
- Clypeus not concave 29
29. Apical joint of the flagellum longer than the penultimate and strongly curved 30
- Apical joint of the flagellum no longer than the penultimate, less strongly curved 33

30. Penultimate joint of the antennæ strongly split
and hollowed beneath for the reception of the
apical joint *C. ephippium*
Turn.
- Structure of the penultimate joint of the flagel-
lum normal 31
31. Enclosed area of the median segment sparsely
punctured.. .. . *C. baluchistanensis*
Cam.
- Enclosed area of the median segment smooth.. 32
32. Wings flavo-hyaline; ground colour of thorax
ferruginous *C. orientalis* Sm.
- Wings hyaline; ground colour of thorax black.. *C. saussurei* Rad.
var. *chrysothemis*
Turn.
33. Petiole as long as broad or longer 34
- Petiole broader than long.. .. . 36
34. Enclosed area of the median segment smooth
and shining *C. rothneyi* Cam.
- Enclosed area punctured or rugulose 35
35. Clypeus rounded at apex; enclosed area rugu-
lose; almost entirely yellow *C. sulphurea* Cam.
- Clypeus truncate; enclosed area punctured;
black, banded with yellow *C. bolanica* Turn.
36. Abdomen finely and rather shallowly punctured;
clypeus truncate *C. circumcincta*
Turn.
- Abdomen coarsely and deeply punctured; cly-
peus not truncate 37
37. Clypeus bisinuate at apex *C. tetradonta* Cam.
- Clypeus rounded at apex.. .. . *C. flavopicta* Sm.

Cerceris violaceipennis Cam.

Cerceris violaceipennis Cam. Ann. and Mag. Nat. Hist. (7) xiii, p. 292,
1904. ♂.

Cerceris rufoplagiata Cam. Ann. and Mag. Nat. Hist. (7) xv, p. 221,
1905. ♂.

♀. Nigra, opaca; clypeo, margine interiore oculorum, carina frontali,
scopo, flagello basi, pronoto, tegulis, scutello, post-scutello, segmento abdo-
minali primo apice, secundo basi, tertio fascia apicali, tibiis tarsisque ferru-
gineis; alis subhyalinis, costa obscuriore, stigmatibus testaceo, clypeo lamina
porrecta, subquadrata; mesopleuris, haud tuberculatis; segmento mediano
area basali oblique striata, apice punctata; segmento ventrali secundo area
basali elevata, area pygidiali late ovata.

♂. *Feminæ similis*; clypeo albopiloso; apice late truncato, minutissime tridentato, nigro, macula basali fulvo-ferruginea.

Long. ♀, 12 mm.; ♂, 8 mm.

♀. Clypeus with the lamina porrect, free from the base, nearly as long as broad, convex and truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum nearly half as long as again as the third. Eyes almost parallel; posterior ocelli further from the eyes than from each other. Mesopleuræ not tuberculate; first abdominal segment nearly as long as broad; second ventral segment with a raised area at the base; pygidial area broadly ovate, narrow at the base, broadly truncate at the apex, less than half as long again as broad. Finely punctured rugulose, the median segment and mesopleuræ rugose; enclosed area at the base of the median segment finely obliquely striated at the base, finely punctured at the apex. First recurrent nervure received a little before the middle of the second cubital cell.

♂. As in the female; but the clypeus is convex, truncate at the apex, with three very minute teeth on the apical margin. First abdominal segment about one-quarter longer than the greatest breadth. Pygidial area not much longer than broad, slightly narrowed at the extremities. Closely and finely punctured.

Habitat—Khasi Hills. 6,000 ft. August.

I took both sexes at Shillong; the female not having been described previously. It is remarkable in having the raised area at the base of the second ventral segment together with the free lamina on the clypeus of the female.

Cerceris orientalis Sm.

Cerceris orientalis Sm. Cat. Hym. B. M. IV, p. 454, 1856. ♀ ♂.

♀. Sordide ferruginea; mandibulis apice, maculaque supra antennis nigris; alis flavo-hyalinis, apice infumatis; clypeo lamina porrecta, lata, apice semicirculariter emarginata; mesopleuris tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla.

♂. *Feminæ similis*, clypeo et fronte flavis; clypeo latitudine sesqui longiore, apice truncato, ante apicem longitudinaliter impresso.

Long. ♀, 18-23 mm.; ♂, 17-18 mm.

Variat ♂ macula post oculos, pronoto, segmentisque abdominalibus 3-6 flavis.

♀. Clypeus with a porrect lamina from the base, the lamina nearly twice as broad at the apex as long, broadened to the apex and deeply and widely emarginate, depressed beneath the lamina and widely emarginate at the apex. Antennæ inserted low down on the front, nearly three times

as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Head large, the cheeks broader than the greatest breadth of the eyes. Pygidial area half as broad again at the base as at the apex, gradually narrowed, truncate at the apex, about twice as long as the greatest breadth. First recurrent nervure received at the middle of the second cubital cell. Closely but not coarsely punctured.

♂. Clypeus half as long again as broad, truncate at the apex, a depressed longitudinal groove from near the middle to the apex. Apical joint of the flagellum strongly curved, longer than the penultimate; antennæ inserted less than twice as far from the anterior ocellus as from the base of the clypeus. Pygidial area truncate at the apex, slightly narrow from base, less than twice as long as the greatest breadth.

Habitat—Bengal; Madras; Central Provinces; Deesa.

Cerceris saussurei Rad.

Cerceris saussurei Rad. Fedtschenko: Turkestan Sphegid, p. 60, 1877,

♂ var. *chrysothemis* var. n.

♀. Ferruginea, clypeo, fronte, et abdomine segmentis 3-5 flavis; alis subhyalinis, apice infuscatis; clypeo lamina libera, longitudine duplo latiore, apice emarginata, mesopleuris bituberculatis; segmento mediano area basali nitida.

Long. 19 mm.

♂. Flavus; vertice, mesothorace, area basali segmenti mediani, segmentisque abdominalibus 3-6 basi nigris; antennis, segmento mediano, abdominis segmento primo, secundoque basi ferrugineis; clypeo latitudine fere duplo longiore, apice truncato.

Long. 15 mm.

♀. Clypeus with a free lamina from the base, the lamina short, twice as broad as long, widely and shallowly emarginate at the apex; the apical margin of the clypeus below the lamina widely emarginate and clothed with long hairs. Antennæ inserted fully twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum nearly as long as the first and third combined. Posterior ocelli further from the eyes than from each other; cheeks a little broader than the greatest breadth of the eyes. Pronotum strongly depressed in the middle, rounded at the angles. Mesopleuræ armed with two small tubercles. First abdominal segment nearly twice as broad as long, slightly constricted at the apex, second ventral segment without a raised area at the base. Pygidial area elongate ovate, twice as long as the greatest breadth, rounded at the apex. Rather sparsely punctured, closely and coarsely on the median segment and mesopleuræ; very sparsely on the apical segments of the abdomen; the enclosed space at the base of the median

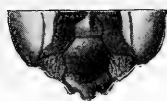
MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE A.

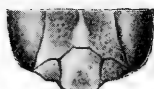
1.	<i>Cerceris vigilans</i> , Sm. ♂.	Front of head.
2.	„ „ „ ♀.	„ „
3.	<i>Cerceris funerea</i> , Costa var. <i>pallidopicta</i> , Rad. ♀.	„ „
4.	<i>Cerceris quettaensis</i> , Cam. ♀.	„ „
5.	<i>Cerceris pulchella</i> , Klug. ♀.	„ „
6.	<i>Cerceris saussurei</i> , Rad. var. <i>chrysothemis</i> , Turn. ♂.	„ „
7.	„ „ „ „ „ „ ♀.	„ „
8.	<i>Cerceris orientalis</i> , Sm. ♀.	„ „
9.	<i>Cerceris pruinosa</i> , Morice. ♀	„ „
10.	<i>Cerceris wroughtoni</i> , Cam. ♀.	„ „
11.	<i>Cerceris leucozonica</i> , Schlett. ♀.	„ „
12.	<i>Cerceris rothneyi</i> , Cam. ♀.	„ „
13.	<i>Cerceris binghami</i> , Turn. ♀.	„ „
14.	<i>Cerceris inesorabilis</i> , Turn. ♀.	„ „
15.	<i>Cerceris tetradontu</i> , Cam. ♀.	„ „
16.	<i>Cerceris nebulosa</i> , Cam. ♀.	„ „
17.	<i>Cerceris agnata</i> , Turn. ♀.	„ „
18.	<i>Cerceris ephippium</i> , Turn. ♀.	„ „
19.	<i>Cerceris flavoplagiata</i> , Cam. ♀.	„ „
20.	<i>Cerceris flavopicta</i> , Sm. ♀.	„ „
21.	<i>Cerceris hilaris</i> , Sm. ♀.	„ „
22.	<i>Cerceris humbertiana</i> , Sauss. var. <i>viscosus</i> , Sm. ♀.	„ „
23.	<i>Cerceris kirbyi</i> , Bingham. ♀.	„ „
24.	<i>Cerceris latibalteata</i> , Cam. ♀.	„ „



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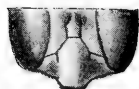
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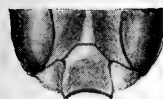
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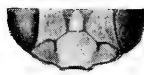
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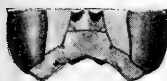
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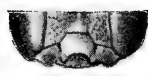
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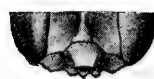
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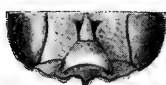
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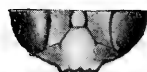
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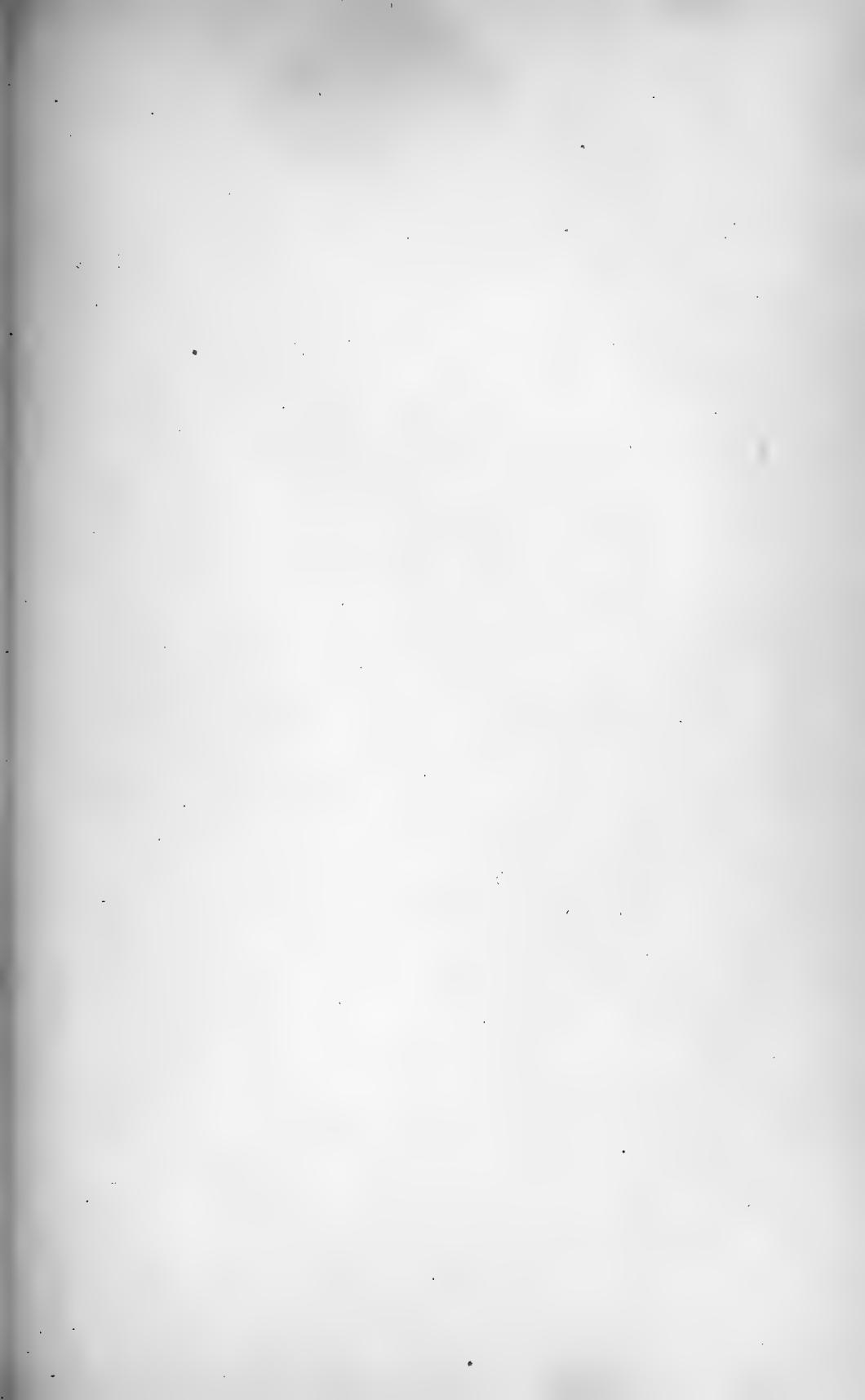


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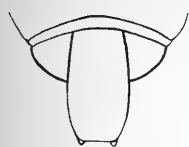
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MONOGRAPH OF THE WASPS OF BRITISH INDIA

EXPLANATION OF PLATE B.

25.	<i>Cerceris vigilans</i> , Sm. ♂.	Pygidial area.
26.	„ „ „ ♀.	„ „
27.	<i>Cerceris funerea</i> , Costa var. <i>pallidopicta</i> , Rad. ♀.	„ „
28.	<i>Cerceris quettaensis</i> , Cam. ♀.	„ „
29.	<i>Cerceris pulchella</i> , Klug. ♀.	„ „
30.	<i>Cerceris saussurei</i> , Rad. var. <i>chrysothemis</i> , Turn. ♂.	„ „
31.	„ „ „ „ „ ♀.	„ „
32.	<i>Cerceris orientalis</i> , Sm. ♀.	„ „
33.	<i>Cerceris pruinosa</i> , Morice. ♀.	„ „
34.	<i>Cerceris wroughtoni</i> , Cam. ♀.	„ „
35.	<i>Cerceris leucozonica</i> , Schlett. ♀.	„ „
36.	<i>Cerceris rothneyi</i> , Cam. ♀.	„ „
37.	<i>Cerceris binghami</i> , Turn. ♀.	„ „
38.	<i>Cerceris inexorabilis</i> , Turn. ♀.	„ „
39.	<i>Cerceris tetradonta</i> , Cam. ♀.	„ „
40.	<i>Cerceris nebulosa</i> , Cam. ♀.	„ „
41.	<i>Cerceris agnata</i> , Turn. ♀.	„ „
42.	<i>Cerceris ephippium</i> , Turn. ♀.	„ „
43.	<i>Cerceris flavoplagiata</i> , Cam. ♀.	„ „
44.	<i>Cerceris flavopicta</i> , Sm. ♀.	„ „
45.	<i>Cerceris hilaris</i> , Sm. ♀.	„ „
46.	<i>Cerceris humbertiana</i> , Sauss. var. <i>viscosus</i> , Sm. ♀.	„ „
47.	<i>Cerceris kirbyi</i> , Bingham. ♀.	„ „
48.	<i>Cerceris latibalteata</i> , Cam. ♀.	„ „



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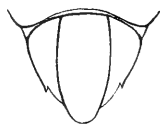
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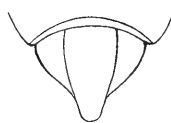
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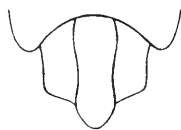
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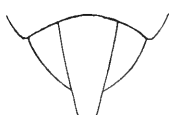
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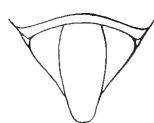
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segment smooth and shining, the median groove indistinct. First recurrent nervure received at the middle of the second cubital cell.

Ferruginous; clypeus, front and abdominal segments 3-5 bright yellow. Wings hyaline, tinged with yellow, a small fuscous cloud at the apex; nervures ferruginous.

♂. Clypeus nearly twice as long as broad, narrowly truncate at the apex. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum longer than the third, the apical joint distinctly curved and truncate at the apex. Posterior ocelli as far from each other as from the eyes. First abdominal segment twice as broad as long; pygidial area with parallel sides, about half as long again as broad. Head and thorax coarsely and closely punctured, sparsely on the scutellum; the triangular space at the base of the median segment smooth and shining, with a distinct median furrow; the abdomen deeply but not very closely punctured. Yellow; the vertex, prothorax, enclosed area at the base of the median segment and the base of abdominal segments 3-6 black; antennæ, median segment, first abdominal segment and the base of the second segment ferruginous. Legs ferruginous variegated with yellow. Wings as in the female.

Habitat.—Quetta (Nurse). June and July.

I am not sure that I am correct in my identification of this species, the original description being of the male only, and not mentioning details of structure. The male from Quetta differs from the typical form in having much of the ferruginous colour replaced by yellow, but otherwise agrees well with the figure. The type was taken in the deserts of the Sir Daria.

Cerceris acuta Rad.

Cerceris acuta Rad. Fedtschenko Reise, Turkestan, p. 54, 1877. ♀.

♀. Nigra; mandibulis, apice excepto, clypeo, margine interiore oculorum late, carina frontali, scapo, macula post oculos, vertice fascia curvata, pronoto, mesopleuris maculis duabus, scutello, postscutello, segmento mediano maculis magnis lateralibus, segmento dorsali secundo basi, tertio, quarto, quintoque fascia emarginata apicali, segmento ventrali secundo tertioque, coxisque flavis; flagello, tegulis, abdomine pedibusque ferrugineis; alis subhyalinis, apice infuscatis; venis fuscis, stigmatibus testaceo; clypeo lamina libera porrecta, bilobata; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata nulla, segmento mediano area longitudinaliter rugoso.

Long. 13 mm.

♀. Lamina of the clypeus free from the base, porrect, broader than long, very deeply incised; the apical margin below the lamina produced into a point. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum

half as long again as the first. Posterior ocelli nearly half as far again from the eyes as from each other. Pygidial area ovate, almost pointed at the base, rather broadly truncate at the apex; first abdominal segment as long as broad. First recurrent nervure received close to the middle of the second cubital cell. Closely but not very deeply punctured, sparsely and shallowly on the abdomen, the enclosed area at the base of the median segment longitudinally rugose.

Habitat.—Kangra Valley, 4,500 ft. (*Dudgeon*).

This differs considerably in colour from the typical form. The clypeus, however, corresponds well with Radoszkowski's figure, and I have little doubt that it is identical, though the original description is too insufficient for certainty.

Cerceris hilaris Sm.

Cerceris hilaris Sm., Cat. Hym. B. M. IV., p. 452, 1856. ♀.

Cerceris himalayensis Bingh. Journ. Bombay Nat. Hist. Soc. XII, p. 120, 1898, ♂. (nec Cameron, 1905).

Cerceris simlaensis Cam. Entomologist, p. 83, 1905, ♂.

♀. Nigra, clypeo in medio, margine interiore oculorum, macula post oculos, pronoto in medio interrupto, scutello macula utrinque, postscutello, segmento mediano fascia longitudinali utrinque, segmento dorsali primo apice late, segmentis 2-5 fascia angusta apicali flavis; antennis basi, segmento abdominali secundo, pedibusque rufo-testaceis; alis subhyalinis, apice infuscatis; clypeo lamina libera, porrecta, longitudine latiore, apice late emarginata; mesopleuris haud tuberculatis, segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area elevata basali nulla.

♂. Niger; clypeo, fronte, macula post oculos, pronoto utrinque, tegulis, postscutello, segmento mediano angulis basalibus flavo-lineato, segmentis abdominalibus 1-6 fascia angusta apicali, pedibusque flavis; flagello basi testaceo; clypeo latitudine longiore, margine apicali truncato, in medio valde impresso, segmentis ventralibus 5-6 apice utrinque spino longo armatis.

Long. ♀, 14 mm.; ♂, 10-11 mm.

♀. Lamina of the clypeus porrect and free, broadened from the base, twice as broad at the apex as long, and widely emarginate. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Eyes almost parallel, the posterior ocelli further from the eyes than from each other. First abdominal segment more than half as broad again as long; second ventral segment without a raised area at the base; pygidial area narrowed from the base, twice as broad at the base as at the apex, twice as long as the greatest breadth, truncate at the apex. Fifth ventral

segment depressed in the middle on the apical margin. Shallowly punctured, the enclosed space at the base of the median segment longitudinally striated.

♂. Clypeus smooth and shining, longer than broad, truncate at the apex, deeply impressed on the middle of the apical margin, with a minute tooth on each side. Apical joint of the flagellum strongly curved, scarcely longer than the penultimate. Fifth and sixth ventral segments with a long spine on each side at the apical angles, the spines of the sixth segment blunt at the apex. Pygidial area large nearly as broad at the apex as long, broadened to the base, truncate at the apex. Enclosed area at the base of the median segment longitudinally striated.

Habitat.—Simla (*Nurse*), ♂; N. India (*Smith*), ♀.

I think I am right in treating these as sexes of one species. Bingham includes *hilaris* ♂ in his description of the female, but mentions no differences. He also gives Madras as a locality, but I do not know on what authority. I have seen the type of *simlaensis*, Cam.

Cerceris humbertiana Sauss.

Cerceris humbertiana Sauss, Reise D. Novara Zool. II.

? *Cerceris emortualis* Sauss, Reise D. Novara Zool. II.

♀. Nigra; primo segmento abdominali rufo-ferrugineo; clypeo, fronte, pronoto, tegulis, mesopleuris macula, scutello fascia interrupta, post-scutello, segmento mediano fascia longitudinali utrinque, segmentis 2-4 fascia lata emarginata vel interrupta, segmento quinto, segmentis ventralibus pedibusque flavi; alis hyalinis, apice valde infumatis; clypeo lamina porrecta, longitudine vix latiore, apice leviter emarginata; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; area pygidiali apice emarginata.

♂. Feminae similis; segmento primo abdominali nigro; clypeo apice rotundato, tridentato.

Long. ♀, 10 mm.; ♂, 9 mm.

♀. Clypeus with the lamina porrect from the base, scarcely broader at the base than long, slightly widened to the apex and very feebly emarginate. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about one-quarter longer than the third. Eyes almost parallel, posterior ocelli half as far again from the eyes as from each other. Mesopleuræ not tuberculate; first abdominal segment more than twice as broad as long; second ventral segment without a raised area at the base; pygidial area rugulose almost pointed at the base, widened rather sharply near the base, the sides on the apical half very slightly converging, the apical margin broad and very shallowly emarginate, the area less than twice as long as the greatest breadth. Coarsely punctured; the enclosed area at the base of the median

segment smooth and shining, the median groove very indistinct. First recurrent nervure received beyond one-third from the base of the second cubital cell.

♂. Clypeus much longer than broad, rounded at the apex and armed with three small teeth. Apical joint of flagellum shorter than the penultimate and only feebly curved; antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus. Pygidial area twice as long as broad, truncate at the apex, the sides parallel.

Habitat—Colombo, Ceylon (*Wickwar*).

I have not seen specimens answering to the description of *emortualis*, but am inclined to treat it as a variety as Saussure suggests. The ground colour of *humbertiana* varies considerably, the black tending to be more or less replaced by ferruginous which is the normal ground colour in *viscosus*, Sm. Bingham treats *viscosus* as a synonym of *humbertiana* but the lamina of the clypeus is much boarder and more distinctly emarginate. I consider that *flavopicta*, Sm. is probably a local race differing in the shallow puncturation, and the much smaller lamina of the clypeus. But for the present it is better to keep this form distinct. I have only seen *flavopicta* from West and North-West India, *viscosus* from Bengal and *humbertiana* from Ceylon. Bingham, however, gives Assam and other localities in N.-E. India for *flavopicta*, but possibly his specimens may have been incorrectly identified. The locality Barrackpore for *flavopicta* is not confirmed by any specimen now in the Rothney collection.

Cerceris humbertiana Sauss. subsp. *viscosus* Sm.

Cerceris viscosus Sm. Trans. Ent. Soc. London, p. 40, 1875, ♀.

Cercerus rufinodis Sm. Trans. Ent. Soc. London, p. 41, 1875, ♂.

♂. Differs from typical *humbertiana* in the shape of the lamina of the clypeus, which is about half as broad again at the base as long. The usual ground colour is ferruginous.

♂. This sex does not differ appreciably from typical *humbertiana*. The ground colour is usually black with a red petiole.

Habitat—Bengal.

Cerceris flavopicta Sm.

Cerceris flavopicta Sm. Cat. Hym. B. M. IV., p. 451, 1856, ♀ ♂.

Cerceris sulphurea Bingh. Fauna Brit. India Hymen. I., p. 305, 1897, ♀ ♂ (nec Cameron).

♀ Nigra; antennis anoque rufo-testaceis; clypeo, fronte, scapo, genis, pronoto, tegulis, scutello, postscutello, mesopleuris, segmento mediano macula magna utrinque, segmentis dorsalibus 1-4 macula magna utrinque, quinto facia lata, pedibusque flavis; alis hyalinis, apice infuscatis; clypeo lamina libera, porrecta, apice truncata; mesopleuris haud dentatis;

segmento mediano area basali nitida ; segmento ventrali secundo area basali elevata nulla ; area pygidiali apice late truncata.

♂. Feminae similis ; segmentis abdominalibus fasciis latis flavis ; clypeo convexo, apice late rotundato.

♀. Very nearly allied to *C. humbertiana* Sauss. ; but the lamina of the clypeus is short, as long as the breadth at the apex, slightly broader at the base than at the apex ; the apical margin of the clypeus is distinctly bisinuate but not tridentate as in *humbertiana* ; the first abdominal segment is a little narrower, being rather less than twice as broad as long ; the pygidial area is a little less widened to the apex, which is truncate ; and the punctures are somewhat finer and shallower.

The clypeus of the male is without teeth at the apex.

Habitat—Bombay (Coll. Rothney) ; N. India (British Museum).

The label has been accidentally shifted, or placed on the wrong specimen originally, in the Rothney collection, which has misled Bingham. The true *sulphurea* Cam., is a male and is marked *flavopicta* in the Rothney collection. This may possibly be the specimen referred to by Bingham as *sulphurea* ♂, but it is so totally distinct from the female described by him that I can hardly think he would have placed them together. The specimen of *flavopicta* in the Rothney collection is from Bombay, and is more finely and sparsely punctured than the typical form from N. W. India.

Cerceris agnata sp. n.

♀. Nigra ; thorace dense, abdomine sparse punctato ; segmento mediano area basali nitida ; clypeo, fronte, macula post oculos, vertice fascia transversa interrupta, pronoto, tegulis, mesopleuris macula, scutello, postscutello, segmento mediano macula magna utrinque, segmento dorsali secundo basi, tertio macula basali nigra, quarto quintoque fascia apicali, segmentis ventralibus 2-5 flavis ; antennis pedibusque, posterioribus nigro-variegatis, testaceis ; ano rufo ; clypeo lamina libera, mesopleuris haud tuberculatis, segmento ventrali secundo area basali elevata nulla ; alis hyalinis, apice infumatis.

Long. 9 mm.

♀. Clypeus with a free lamina, which is half as broad again as long and truncate at the apex. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third. Posterior ocelli a little further from the eyes than from each other ; the eyes diverging slightly towards the clypeus. Mesopleuræ without tubercles ; first abdominal segments longer than broad ; second ventral segment without a raised area at the base ; pygidial area narrowly rounded at the apex twice as wide at the base as at the apex, gradually narrowed, twice as long as the greatest breadth. Head and thorax closely but not coarsely

punctured ; the enclosed area at the base of the median segment smooth and shining, with a deep median groove ; abdomen more sparsely and finely punctured . First recurrent nervure received at one quarter from the base of the second cubital cell.

Habitat—Thaung-yin Valley, Tenassarim (*Bingham*). June 1891.

In colour this closely resembles *C. kirbyi* Bingham, but the clypeus is quite different and the thorax is much more coarsely punctured.

Cerceris flavoplagiata Cam.

Cerceris flavoplagiata Cam. Entomologist, p. 16, 1905, ♀.

♀. Nigra ; capite, mesonoto, scutello, antennisque rufo-ferrugineis ; clypeo, fronte, genis, vertice maculis duabus utrinque, pronoto, mesopleuris maculis duabus, scutello macula utrinque, segmento mediano macula magna, utrinque, segmento abdominali dorsali secundo basi late, ventrali toto, segmentis 2-5 apice fascia angusta flavis ; pedibus rufo flavoque variegatis ; alis subhyalinis, apice infuscatis, venis testaceis ; clypeo lamina apicali libera, porrecta, apice truncata ; mesopleuris haud tuberculatis ; segmento ventrali secundo area basali elevata nulla ; segmento mediano area basali delicatissime punctata.

Long. 15 mm.

♀. Clypeus with the lamina free, springing from below the middle and truncate at the apex. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum nearly half as long again as the first. Eyes distinctly diverging towards the clypeus, the posterior ocelli quite half as far again from the eyes as from each other. Mesopleuræ without tubercles ; first abdominal segment longer than broad, second ventral segment without a raised area at the base ; pygidial area rugose, truncate at the apex, twice as long as broad, the sides almost parallel. Finely and shallowly punctured, more coarsely on the vertex ; the enclosed space at the base of the median segment very finely and closely punctured, without a distinct median groove. First recurrent nervure received just before the middle of the second cubital cell.

Habitat—Himalayas.

Cerceris pentadonta Cam.

Cerceris pentadonta Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 262, 1890, ♀.

♀. Nigra ; mandibulis, margine interiore oculorum, carina frontali, pronoto, tegulis, postscutello, segmento dorsali tertio toto, quintoque dimidio apicali fulvo ferrugineis ; alis fusco-hyalinis, apice magis infuscatis ; clypeo in medio tuberculato, porrecto, tuberculo apice inciso, margine apicali utrinque bidentato ; mesopleuris haud tuberculatis ; segmento

mediano area basali punctata, in angulis oblique striata ; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♀. Clypeus with a short, stout, porrect tubercle in the middle, the tubercle notched at the apex ; the apical margin of the clypeus below the tubercle armed with two sharp teeth on each side and a very minute one in the middle. Antennæ inserted low down, more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very little longer than the third. Eyes parallel ; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles ; first abdominal segment nearly twice as long as broad ; second ventral segment without a raised area at the base ; pygidial area fully twice as long as broad, almost pointed at the base and rather narrowly truncate at the apex. Closely but not deeply punctured, more coarsely on the abdomen than on the thorax ; enclosed area at the base of the median segment very finely and closely punctured, finely striated in the angles and on the sides. First recurrent nervure received beyond one third from the base of the second cubital cell.

Habitat—Barrackpore (*Rothney*).

This is near *C. latibalteata* Cam. from which it differs in the form of the lamina of the clypeus and in the greater length of the first abdominal segment. It is also more closely punctured.

Cerceris specifica sp. n.

♀. Nigra ; clypeo, fronte, scapo, linea pone oculos, vertice linea transversa, pronoto, mesonoto macula quadrata, tegulis, scutello, postscutello, mesopleuris maculis duabus, segmento mediano utrinque, segmento secundo dorsali basi flavis ; flagello subtus, segmentis abdominalibus 1-3 apice late, 4-5 apice anguste, pedibusque partim fulva-ferrugineis ; alis hyalinis, apice infumatis ; clypeo lamina ante apicem libera, porrecta, apice leviter emarginata, margine apicali sub lamina obtuse tridentato ; mesopleuris haud tuberculatis ; segmento mediano area basali nitida ; segmento ventrali secundo area basali elevata nulla.

Long.

♀. Clypeus with the lamina porrect from the middle, shallowly emarginate at the apex ; the apical margin below the lamina with three blunt teeth, rather narrow. Antennæ inserted less than half as far again from the anterior ocellus as from the base of the clypeus, second joint of the flagellum nearly half as long again as the third. Eyes parallel, the posterior ocelli further from the eyes than from each other. First abdominal segment longer than broad, widest in the middle ; second ventral segment without a raised area at the base ; pygidial area elongate ovate, truncate at the apex and a little wider than at the base, more than twice as long as

the greatest breadth. Closely and rather finely punctured; the enclosed area at the base of the median segment smooth and shining, with a shallow median groove. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat—Kandy, Ceylon (*Wickwar*). June.

This is quite distinct from *humbertiana*, Sauss., the lamina of the clypeus being free from the middle only, and not from the base; and the first abdominal segment being slender.

A male closely resembling *C. lepcha* Cam. sent by Mr. Wickwar from Haputale, Ceylon, probably belongs to this species.

Cerceris latibalteata Cam.

Cerceris latibalteata Cam. Ann. and Mag. Nat. Hist. (7) XIII., p. 292 1904, ♀.

? *Cerceris lepcha* Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 222, 1905, ♂.

♀. Nigra; mandibulis, carina frontali, margine interiore oculorum, pronoto, scutello, postscutello, segmento dorsali tertio, segmento, quinto apice, tarsisque anterioribus fulvo-ferrugineis; alis fusco-hyalinis, apice obscurioribus; clypeo convexo, lamina ante apicem libera, truncata, margine apicali sub lamina utrinque bidentato; mesopleuris haud dentatis; segmento mediano area basali subnitida, in angulis striata; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♀. Clypeus convex, the lamina free from a little below the middle and porrect, truncate at the apex, the apical margin of the clypeus below the lamina armed with two well defined teeth on each side. Antennæ inserted twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about one-quarter longer than the third. Eyes parallel; the posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ without tubercles; first abdominal segment broadest in the middle, as long as the greatest breadth; second ventral segment without a raised area at the base; pygidial area elongate ovate, as broad at the apex as at the base, about two and a half times as long as the greatest breadth, narrowly truncate at the apex. Finely punctured, more coarsely on the abdomen than elsewhere; the median segment slightly shining and rather sparsely punctured, the enclosed area at the base minutely punctured, finely striated in the angles, with a shallow median groove. First recurrent nervure received beyond one-third from the apex of the second cubital cell.

Habitat—Khasi Hills (Coll. Rothney).

This species is very near *pentadonta* Cam. but differs as noticed under that species.

I consider that *C. lepcha* Cam. will probably prove to be male, but do not think the evidence is sufficient to place them together. If my surmise is correct, it is probable that *basimacula* Cam. which is nearly allied to *lepcha*, would be the male of *pentadonta*.

Cerceris lepcha Cam.

Cerceris lepcha Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 222, 1905, ♂.

♂. Niger; clypeo, margine interiore oculorum, segmento mediano macula apicali utrinque, segmento abdominali secundo basi, trochanteribusque pallide flavis; pronoto utrinque, tegulis, scutello macula utrinque, postscutello, segmentisque dorsalibus tertio quintoque fere totis flavo-ochraceis; alis subhyalinis, apice leviter infumatis; clypeo apice truncato; mesopleuris haud tuberculatis; segmento mediano area basali subnitida, minutissime punctata; segmento abdominali primo latitudine triplo longiore; segmento ventrali secundo area basali elavata nulla,

Long. 7 mm.

♂. Clypeus nearly as broad as long, truncate at the apex. First abdominal segment very slender, three times as long as broad; pygidial area twice as broad at the base as at the apex. Rather finely and sparsely punctured, more closely and coarsely on the abdomen than on the thorax or median segment.

Habitat—Khasi Hills, 5,000 ft. April (*Turner*).

As mentioned above, I think this will prove to be the male *latibalteata* Cam.

Cerceris basimacula Cam.

Cerceris basimacula Cam. Ann. and Mag. Nat. Hist. (7) XX, p. 87, 1907, ♂.

♂. "Black; a mark on the centre of the clypeus (obliquely narrowed above and below, a broad line on its apex, a broad line on the inner orbits from the antennæ, two large oblique marks on the apex of the metanotum (extending on to the pleuræ), the basal third of the abdominal petiole on the sides, more than the basal third of the second segment, and narrow lines on the apices of the fourth and fifth segments, yellow; the sides of the central and lower parts of the clypeus, prothorax, scutellums more than the apical third of the second and third abdominal segments, a line behind the yellow on the fourth and fifth, and the apical two segments entirely dark rufous; the apex of the first segment of a paler rufous colour. Four front legs pale rufo-testaceous; the tibiæ and base of tarsi yellow; the hind legs similarly but much darker coloured. Wings hyaline, the radial cellule smoky, the apical cubital cellule of a deeper smoky colour; the costa and stigma dark testaceous, the nervures black. Antennæ rufo-testaceous, the space yellow below, the eight apical joints blackish, paler below ♂.

Length 10 mm.

Sikkim.

Face strongly but not closely punctured; the clypeus more finely and closely punctured; there is a short keel in the centre of the latter, with a fovea on either side. Front and vertex strongly, somewhat closely punctured. Middle of pronotum closely punctured, the sides almost smooth; mesonotum somewhat strongly but not closely punctured; the scutellum is more strongly but not so closely punctured as the latter. Postscutellum smooth. Metanotum strongly punctured, the punctures clearly separated; the area shining, smooth. Head and thorax densely covered with white pubescence. First abdominal segment of equal width, about four times as long as wide, longer than the second; the segments strongly punctured; the pygidium strongly but not very closely punctured; the sides rounded, narrowed at the base and apex, the latter slightly rounded inwardly. The whole abdomen covered with longish white pubescence. Hypopygium depressed at the apex; the latter has a slight rounded incision.

Allied to *C. lepcha* Cam."

Cerceris elizabethæ Bingham

Cerceris elizabethæ Bingham. Fauna Brit. India, Hymen I., p. 312, 1897, ♀.

♀. Nigra, rugose punctata, segmento mediano area basali oblique striata; mandibulis basi flavis; segmentis abdominalibus primo toto, secundo basi rufotestaceis; antennis, tibiis tarsisque fusco-ferrugineis; clypeo apice lamina libera truncata; mesopleuris bituberculatis; segmento ventrali secundo area basali elevata nulla; alis hyalinis, apice infumatis, venis testaceis.

Long. 11 mm.

♀. The lamina of the clypeus is porrect at the apex, the apical margin transverse; the clypeus short and broad. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third posterior ocelli further from the eyes than from each other; the eyes diverging towards the clypeus. Mesopleuræ armed with two acute tubercles; first abdominal segment a little longer than broad; pygidial area more than twice as long as the greatest breadth, narrowed towards the rounded apex. First recurrent nervure received at the middle of the second cubital cell.

Habitat—Thaungyin Valley, Tenasserim (Bingham). May.

Cerceris ephippium sp. n.

♀. Nigra, luxuriose flavovariegata, clypeo subconcavo, late emarginato prope angulos acute marginato, genis dente armatis, segmento mediano area basalis oblique striata, area pygidiali apice truncata, segmento ventrali quinto apice crasse elevato.

Long. 13 mm.

Mandibles with a strong tooth on the inner margin near the middle; clypeus slightly concave, widely and deeply emarginate at the apex, with, an oblique carina on each side close to the apical angles. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum distinctly longer than the third. Head very broad, the eyes diverging a little towards the clypeus, separated on the front by a distance equal to about three times the length of the scape. Cheeks very broad, exceeding the greatest breadth of the eye, and armed with a stout acute tooth. Posterior ocelli more than half as far again from the eyes as from each other. Head, thorax and abdomen closely but not deeply punctured, more shallowly on the abdomen than elsewhere. Pronotum shallowly depressed in the middle; mesopleuræ armed with two small spines before the intermediate coxæ. Enclosed area at the base of the median segment obliquely striated, divided by a shallow median groove. First abdominal segment nearly twice as broad as long, the second segment only half as broad again as the first, without a raised area at the base on the ventral surface. Fifth ventral segment not margined or raised, without spines at the angles. Pygidial area twice as long as the greatest breadth, gradually narrowed and truncate at the apex, nearly twice as broad at the base as at the apex. First recurrent nervure received at the middle of the second cubital cell.

Lemon yellow; front and vertex black; an oblique spot on each side on the vertex, the front below the base of the antennæ, produced upwards in three parallel bands, the middle one reaching the anterior ocellus yellow; mesonotum black, with a yellow longitudinal band on each side near the middle and a spot above the tegulæ; the enclosed area at the base of the median segment black with two small yellow spots; a broad line extending to the apex of the median segment, the base of all the dorsal abdominal segments narrowly, and a line on the middle of segments 1-4 black. Flagellum and pygidial area testaceous brown. Wings hyaline, fuscous at the extreme apex.

Habitat—Karachi (*Comber*), September and October; Deesa (*Nurse*); S. Othman, Arabia (*Nurse*). March.

Near *C. Komarowii* Rad. but in that species there are two tubercles near the middle of the clypeus, and the shape of the pygidial area is different.

♂ Similar to the female, but the clypeus is strongly convex, half as long again as the greatest breadth and truncate at the apex. Antennæ inserted half as far again from the anterior ocellus as from the base of the clypeus. Cheeks without spines. Pygidial area more than half as long again as broad, the sides parallel. The apical joint of the flagellum is strongly curved. This species has probably reached the desert portion

of N. W. India from Arabia, which may be found to be the home of other Karachi species also.

Cerceris inexorabilis sp. n.

♀. Flava, capite mesonotoque nigris flavovariegatis; clypeo plano, emarginato, prope angulos acute carinato, genis dente maximo armatis; segmento mediano area basali nitida.

Long. 13 mm.

Clypeus short, flat, emarginate at the apex, with an acute oblique carina on each side near the apical angles. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum almost as long as the first and third combined; the carina between the antennæ rather low, triangularly truncate at the apex. Head broad; the eyes diverging towards the clypeus, separated on the front by more than two and a half times the length of the scape; cheeks very broad, nearly half as broad again as the greatest breadth of the eye, armed with a very long stout spine. The whole insect closely, but not very deeply punctured; the enclosed area at the base of the median segment smooth and shining, divided by a longitudinal furrow. Pronotum strongly depressed in the middle, subtuberculate on each side; mesopleuræ with two very small spines in front of the intermediate coxæ. First abdominal segment short, nearly twice as broad as long; second ventral segment without a raised area at the base; fifth ventral segment not raised on the margin; pygidial area granulate, gradually narrowed from the base, truncate narrowly at the apex, about three times as broad at the base as at the apex. First recurrent nervure received near the middle of the second cubital cell.

Dull lemon yellow; front, vertex and mesonotum black; the front below base of the antennæ, produced upwards in three parallel bands, the middle one reaching the anterior ocellus yellow; two oblique yellow bands on the vertex; two yellow longitudinal bands on each side of the mesonotum; pygidial area fuscous. Wings hyaline, clouded at the apex, stigma testaceous.

Habitat—Karachi (Comber).

This may possibly be *C. seravensis* Rad. but in the description of that insect there is no mention of the large spine on the cheeks, which could hardly have been overlooked. The present species is very near the last, (*ephippium*), but the clypeus is narrower, especially on the apical margin, the sculpture of the area at the base of the median segment is quite different, the pygidial area is narrower at the apex, and the pronotum is subtuberculate.

Cerceris fletcheri sp. n.

♂. Flavo-ochracea; mandibulis apice nigris; alis hyalinis, apice

infumatis; clypeo fere plano, apice late emarginato, angulis subporrecto; genis dente armatis; mesopleuris minute bituberculatis; segmento mediano area basali lævi, opaca; segmento ventrali secundo area basali elevata nulla.

Long. 9 mm.

♀. Clypeus broader than long, widely emarginate at the apex; the emargination near the angles furnished with a slightly porrect oblique carina on each side. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum about half as long again as the third. Eyes slightly divergent towards the clypeus; the posterior ocelli nearly half as far again from the eyes as from each other. Cheeks about as broad as the eyes, armed with a short tooth. Pronotum deeply depressed in the middle, rounded at the angles; mesopleuræ with two minute tubercles. First abdominal segment twice as broad as long; second ventral segment without a raised area at the base; pygidial area broadly rounded at the apex, more than half as broad again at the base as at the apex, gradually narrowed, about twice as long as the greatest breadth. Closely and rather finely punctured; the enclosed area at the base of the median segment smooth but opaque; mesopleuræ deeply punctured.

Habitat—Chapra, Bihar (*Mackenzie*).

In the Pusa Collection.

The colour of the only specimen I have seen is reddish, evidently due to discolouration by cyanide; the colour in life is probably yellow or ochreous. The spine on the cheeks is smaller than in the other two Indian species of the group.

Cerceris sulphurea Cam.

Cerceris sulphurea Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 261, 1890, ♂.

♂. Stramineus; flagello, vertice macula utrinque, mesonoto fasciis tribus longitudinalibus pallide ferrugineis; alis hyalinis, apice infuscatis; clypeo longitudine aequilato, apice late rotundato, mesopleuris haud tuberculatis; segmento mediano area basali punctata segmento abdominali primo latitudine sesqui longiore; segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♂. Clypeus as long as the greatest breadth, broad rounded at the apex. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus; the second joint of the flagellum about one quarter longer than the third; the apical joint equal in length to the penultimate, and very slightly curved. Eyes slightly divergent towards the clypeus; posterior ocelli more than half as far again from the eyes as

from each other. Mesopleuræ without tubercles; first segment of the abdomen about half as long again as broad, second ventral segment without a raised area at the base; pygidial area sparsely punctured, about half as broad again at the base as at the apex, nearly twice as long as the breadth at the apex. First recurrent nervure received at one-fifth from the base of the second cubital cell. Closely and rather deeply punctured, most coarsely on the abdomen; the enclosed space at the base of the median segment punctured, with indistinct oblique striæ at the base.

Habitat—Bombay (Coll. Rothney).

As I have pointed out under *C. flavopicta*, Bingham's description of the female *sulphurea* is taken from *flavopicta*. I doubt if his brief notice of the male can be meant for the present species.

Cerceris wroughtoni Cam.

Cerceris wroughtoni Cam. Mem. Manchester Lit. Phil. Soc. (4), III., p. 258, 1890, ♀.

♀. Nigra; clypeo, fronte, genis, scapo, pronoto, scutello, postscutello mesopleuris macula parva, segmento primo dorsali macula utrinque, secundo tertioque dimidio apicali, quarto quinto macula magna mediana flavis; flagello, segmento mediano macula apicali utrinque, pedibusque testaceis; clypeo brevi, late emarginato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; alis hyalinis, apice infuscatis.

♂. Feminae similis; segmento quarto sextoque flavis, quinto nigro; clypeo apice late rotundato, dentibus tribus minutis armato.

Long. ♀ ♂, 11 mm.

♀. Clypeus short and broad, deeply and very widely emarginate at the apex, flattened. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the interantennal carina low; second joint of the flagellum nearly half as long again as the third. Eyes very slightly diverging towards the clypeus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ without tubercles; first abdominal segment nearly twice as broad as long; second ventral segment without a raised basal area; pygidial area rugulose, large, truncate at the apex, the sides almost parallel, a little less than twice as long as broad. Head closely and finely, thorax and median segment more sparsely punctured, abdomen and the enclosed space at the base of the median segment smooth. Wings subhyaline, stigma testaceous, a fuscous cloud at the apex. First recurrent nervure received beyond onethird from the base of the second cubital cell.

♂. Clypeus a little longer than the greatest breadth, very broadly rounded at the apex and armed with three minute teeth. First abdominal

segment longer than broad; pygidial area coarsely punctured, large, a little less than twice as long as broad, the sides parallel. Thorax and median segment more closely and deeply punctured than in the female; the enclosed area at the base of the median segment coarsely obliquely striated; abdomen sparsely punctured.

Habitat—Nasik, W. India (*Comber*). September.

I have not seen the type, but Cameron's description is quite sufficient.

Cerceris binghami sp. n.

Cerceris ferox Bingh. Fauna Brit. India Hym. I, p. 310, 1897, ♀. (nec *ferox* Sm.).

♀. Niger, clypeo, fronte, macula post oculos, pronoto utrinque, post-scutello, segmento mediani macula apicali utrinque, segmentis abdominalibus 2-5 fascia angusta apicali, tibiisque anticis et intermediis flavis; tarsis anticis et intermediis rufotestaceis; alis fusco-hyalinis; clypeo brevi, late emarginato, lobis lateralibus tuberculatis; mesopleuris haud tuberculatis, segmento mediano area basali longitudinaliter striata, segmento ventrali secundo area basali elevata nulla.

Long. 14 mm.

♀. Middle lobe of the clypeus twice as broad as long, flat, the apical margin very widely emarginate, not recurved. Lateral lobes of the clypeus with a small tubercle near the middle. Antennæ inserted low down, more than twice as far from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum half as long again as the third. Head broad, the posterior ocelli more than half as far again from the eyes as from each other. Mesopleuræ without tubercles, second ventral segment without an elevated basal area. First abdominal segment as broad as long; pygidial area large, less than twice as long as broad, truncate at the apex, the sides nearly parallel. Head and thorax coarsely and closely punctured, the mesonotum reticulate, the basal area of the median segment longitudinally striated, without a dividing furrow; abdomen finely and sparsely punctured, the segments not much constricted. First recurrent nervure received beyond the middle of the second cubital cell.

Habitat—Ataran, Tenasserim (*Bingham*). February.

This was treated by Bingham as a variety of *C. ferox* Sm., differing only in colour. But in *ferox* the middle lobe of the clypeus is porrect, with the lamina free at the apex and very broadly rounded; the tubercles on the lateral lobes are on the margin, not near the middle; the first abdominal-segment is much longer than broad, the pygidial area is narrower at the base, gradually narrowed to the apical margin, which is less than half as broad as the base. These distinctions are ample for a specific distinction. Bingham's description of *ferox* seems to be taken from the present species and not from true *ferox*.

Cerceris nebulosa Cam.

Cerceris nebulosa Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 265, 1890, ♀.

Cerceris erythropoda Cam. Ann. & Mag. Nat. Hist. (7) X, p. 57, 1902, ♀.

Cerceris himalayensis Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 220, 1905, ♂.

Cerceris intimella Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 221, 1905, ♀.

Cerceris assamensis Cam. Entomologist, p. 269, 1905, ♂.

♀. Nigra; clypeo, fronte, macula pone oculos, pronoto, segmento abdominali primo apice, secundo basi, tertioque apice ferrugineis; alis fusco-hyalinis, stigmatibus testaceo; clypeo lato, apice semicirculariter emarginato; segmento mediano area basali tenuissime punctata; mesopleuris subtuberculatis; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; clypeo convexo, apice producto et leviter inciso.

Long. ♀, 15 mm.; ♂, 10 mm.

♀. Clypeus broad and flat, bent slightly outwards near the apex and very widely and deeply emarginate. Antennæ inserted low down on the front, separated from the base of the clypeus by a distance not exceeding the length of the third joint of the flagellum; the second joint of the flagellum as long as the first and third combined. Eyes diverging towards the clypeus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two feeble tubercles; first abdominal segment broader than long, strongly constricted at the apex; second ventral segment without a raised area at the base; fifth ventral segment with a narrow longitudinal groove in the middle; pygidial area elongate ovate, twice as long as the greatest breadth, very narrowly truncate at the apex, granulate. Finely and closely punctured, more strongly and sparsely on the abdomen; the median segment rugulose on the apical slope, the enclosed area at the base finely and closely punctured; mesopleuræ striated. First recurrent nervure received just before the middle of the second cubital cell.

♂. Clypeus convex, longer than broad, slightly incised on the middle of the apical margin. Pygidial area a little longer than the breadth at the base, twice as long as the breadth at the apex. Penultimate joint of the flagellum longer than the apical.

Habitat—Khasi Hills, 6,000 ft. June to August.

A fairly common species above Shillong. The extent of the ferruginous colour is very variable. The list of synonyms at the head of this description is an example of the careless descriptions in Cameron's later papers. A female of this species is also labelled in Rothney's

collection as the type male of *C. bimaculata*, but does not correspond to the description. A male of another species, marked *C. bimaculata* type, is doubtless the true type.

Cerceris bimaculata, Cam.

Cerceris bimaculata Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 219, 1905, ♂.

Cerceris canaliculata Cam. Ann. & Mag. Nat. Hist. (7) XV, p. 219, 1905, ♂.

Cerceris cameroni Schulz. Spolia Hymenopt. p. 194, 1906.

♂. Niger; clypeo, fronte, pronoto, scutello macula utrinque, segmento dorsali secundo basi, tertio fascia lata apicali, tibiis tarsisque anticis ferrugineis; alis fusco-hyalinis, stigmata testaceo; clypeo convexo, apice truncato; mesopleuris subtuberculatis; segmento abdominali primo fere sesqui longiore; segmento ventrali secundo area basali elevata nulla; segmento mediano area basali punctata.

Long. 9 mm.

♂. Clypeus convex, truncate at the apex, a little longer than the greatest breadth; antennæ inserted at least half as far again from the anterior ocellus as from the base clypeus; second joint of the flagellum nearly half as long again as the third, apical joint scarcely as long as the penultimate and slightly curved. Eyes parallel; the posterior ocelli more than half as far again from the eyes and from each other. Mesopleuræ subtuberculate; first abdominal segment about half as long again as broad; second ventral segment without a raised area at the base; pygidial area nearly twice as long as broad, the sides parallel. Head and thorax, including the enclosed area at the base of the median segment, very finely and closely punctured; abdomen rather more coarsely punctured; mesopleuræ rugose. First recurrent nervure received at onethird from the base of the second cubital cell.

Habitat—Khasi Hills (Coll. Rothney.)

This species is distinguished from *nebulosa*, Cam., by the longer petiole. The type of *canaliculata* is without the two fulvo-ferruginous spots on the scutellum, but I cannot see that it differs otherwise, nor does Cameron give any other difference in the unfortunate paper in which both are described. He is capable of far better work, as is shown by his paper on the same genus in the memoirs of the Manchester Society for 1890.

Cerceris mastogaster Sm.

Cerceris mastogaster Sm. Cat. Hym. B. M. IV, p. 453, 1856, ♀.

♀. Nigra; clypeo, scapo subtus, pronoto utrinque, tegulis, postscutello, segmento secundo dorsali fascia transversa basali interrupta, tertio quintoque utrinque, tibiis tarsisque flavis; flagello subtus, segmento mediano (area basali excepta), segmentis abdominalibus 1-4, femoribusque ferrugineis; alis hyalinis, apice infumatis; clypeo lato, truncato, apice dentibus duobus minutis armato; segmento mediano area basali nitido; segmento

ventrali secundo area basali elevata nulla ; segmentis ventralibus 3-5 lateribus cristatis, quinto margine apicali reflexo, in medio dentato.

Long. 14 mm.

♀. Clypeus more than half as broad again at the apex as the greatest length, the apical margin truncate, with two small teeth close to the middle ; antennæ inserted a little further from the anterior ocellus than from the base of the clypeus ; the second joint of the flagellum nearly as long as the first and third combined ; posterior ocelli a little further from the eyes than from each other. Pronotum not depressed in the middle ; mesopleuræ without tubercles. First abdominal segment as long as broad ; second ventral segment without a raised area at the base ; ventral segments 3-5 with a strong erect process on each side ; the fifth with the apical margin recurved, with a triangular tooth in the middle. Pygidial area elongate ovate, rather narrowly truncate at the apex, more than twice as long as the greatest breadth, the surface granulate. Strongly punctured ; the enclosed area at the base of the median segment smooth and shining, with a few striæ at the base, divided by a shallow longitudinal furrow. First recurrent nervure received before one-quarter from the base of the second cubital cell.

Habitat—Madras (*W. Elliot*).

I have only seen the type. The structure of the ventral abdominal segments is remarkable, and probably is of assistance to the insect in transporting beetles, perhaps *Buprestidæ*.

Cerceris tetradonta Cam.

Cerceris tetradonta Cam. Mem. Manch. Lit. and Phil. Soc. (4) III., p. 261. 1890.

♀. Nigra, punctata ; clypeo, fronte, genis, vertice fascia transversa utrinque, pronoto, tegulis, mesopleuris macula, scutello, postscutello, segmento mediano macula utrinque, segmentis dorsalibus 1-5, ventralibus 2-4, macula transversa utrinque pallide flavis ; segmento primo basi, femoribusque ferrugineis ; pedibus flavovariegatis ; clypeo apice truncato, quadridentato ; mesopleuris tuberculo parvo ; segmento ventrali secundo area basali elevata nulla, segmento mediano area basali nitida.

♂. Clypeus apice bisinuatus ; fasciæ abdominis fere continuæ.

Long. ♀, 9 mm ; ♂, 7 mm.

♀. Clypeus truncate at the apex, with four blunt teeth. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum half as long again as the third. Mesopleuræ with a minute tubercle ; second ventral segment without a raised area at the base ; first segment twice as broad as long ; pygidial area broadest in the middle, almost pointed at the base, truncate at the apex, nearly twice as long as the greatest breadth. Deeply but not very

closely punctured, more coarsely on the abdomen than on the thorax, the enclosed space at the base of the median segment smooth and shining, the median groove indistinct. Wings hyaline, with a fuscous cloud at the apex; first recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus very feebly bisinuate at the apex; apical joint of the flagellum feebly curved, shorter than the penultimate; first abdominal segment a little broader than long; pygidial area narrowed from the base to the truncated apex. The yellow bands on the abdomen are only very narrowly interrupted and there is no ferruginous colour at the base of the abdomen either on the dorsal or ventral surface. The flagellum is ferruginous.

Habitat—Western India, from Poona to Karachi; Deesa; Abu (Nurse); Karachi (Comber).

Cerceris downesivora sp. n.

♀. Nigra; clypeo in medio, fronte, scapo, linea post oculos, pronotum utrinque, tegulis, postocutello, segmento mediano fascia longitudinali utrinque, segmentis 2—5 fascia angusta apicali, tibiis tarsisque anterioribus et intermediis flavis; alis subhyalinis, apice obscuris; clypeo latitudine longiore, apice obtuse quadridentato; mesopleuris haud tuberculatis, segmento ventrali secundo area basali elevata nulla; segmento mediano area basali nitida.

Long. ♀, 9 mm.

♀. Middle lobe of the clypeus longer than broad, flat, broadest near the base, the apical margin armed with four stout, blunt, short teeth. Antennæ inserted fully half as far again from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum of equal length. Eyes parallel on the inner margin; the posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; pygidial area elongate-ovate, almost pointed at the base, narrowly truncate at the apex, nearly three times as long as the greatest breadth. Closely, but not very deeply punctured; the enclosed area at the base of the median segment smooth and shining, the median groove very indistinct. First recurrent nervure received a little before the middle of the second cubital cell.

Habitat—Pegu Hills (Bingham), April.

"Stores its nest with *Downesia bretteghami*" (Bingham).

Nearly allied to *C. tetradonta* Cam., but has the middle lobe of the clypeus much narrower than in that species and is more closely punctured.

The note about *Downesia* is referred by Bingham (Fauna Brit. India

Hymen. I. p. 300) to *C. elizabethæ*, but is placed on this species in the collection.

The markings in the type are discoloured.

Cerceris kirbyi Bingham.

Cerceris kirbyi Bingham. Fauna Brit. India Hym. I., p. 313, 1897, ♀.

♀. Nigra, subnitida, capite punctato; clypeo, fronte, scapo, genis, vertice fascia, pronoto, tegulis, mesonoto maculis duabus, mesopleuris macula magna interrupta, scutello, postscutello, segmento mediano macula magna utrinque, segmento primo abdominali basi et apice, secundo dimidio basali, tertio macula basali nigra, quarto quintoque apice, pedibusque anticis et intermedus flavis; flagello pygidioque ferrugineis; alis hyalinis, apice leviter infuscatis; clypeo plano, apice quedridentato; segmento mediano area basali nitida, obsolete punctata, segmento ventrali secundo area basali elevata nulla; mesopleuris haud tuberculatis.

Long. 7 mm.

♀. Clypeus almost flat, broader than long, the anterior margin almost straight, armed with four well defined teeth. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus; posterior ocelli half as far again from the eyes as from each other. Pronotum not depressed in the middle, mesopleuræ not tuberculate; second ventral segment without a raised basal area elongate, slightly broader in the middle than at the extremities, fully two and a half times as long as the greatest breadth and narrowly truncate at the apex. The first abdominal segment is about twice as long as broad. Head closely punctured, thorax and abdomen microscopically punctured. First recurrent nervure received at one-third from the base of the second cubital cell.

Habitat—Haundraw Valley, Tenasserim (*Bingham*). September.

Bingham's description of the colour and sculpture is not inaccurate, but his description of the form of the clypeus cannot be taken from the type, to which it bears no resemblance.

Cerceris rothneyi Cam.

Cerceris rothneyi Cam. Mem. Manchester Lit. and Phil. Soc. (4) III. p. 251, 1890.

♀. Ferruginea; fronte supra antennas, segmento abdominali quarto pygidioque nigris; clypeo, fronte, scapo, pronoto, tegulis, mesopleuris macula, scutello, postscutello, segmento secundo basi, tertio macula ferruginea basali quintoque pallide flavis; pedibus flavis, femoribus ferrugineis; clypeo apice truncato dentibus 4 minutis armato; mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla; pygidio angusto, in medio contracto.

♂. Feminæ similis; vertice, mesonoto, segmentoque secundo apice nigris; clypeo apice anguste truncato.

Long. ♀, 12 mm. ; ♂, 10 mm.

♀. Clypeus flattened, the middle lobe half as broad again at the apex as long ; the apical margin straight, armed with four minute blunt teeth. Antennæ inserted almost as far from the base of the clypeus as from the anterior ocellus, second joint of the flagellum half as long again as the third. Eyes very feebly divergent towards the clypeus ; a very minute spine projecting over the base of the mandibles ; posterior ocelli as far from each other as from the eyes. Mesopleuræ without spines ; second ventral segment without a raised area at the base ; first segment a little broader than long ; fifth ventral segment with the apical margin slightly produced in the middle and recurved, the segment raised laterally. Pygidial area very narrow, slightly narrower in the middle than at the extremities, rounded at the apex, three times as long as the greatest breadth. Closely but not coarsely punctured ; the basal area of the median segment smooth and shining with an indistinct median groove. Wings hyaline, with a fuscous cloud at the apex, nervures fuscous, stigma testaceous. First recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus longer than broad, the apical margin rounded at the sides, narrowly truncate in the middle. First abdominal segment much longer than broad ; pygidial area half as long again as the breadth at the base, slightly narrowed to the apex.

Habitat—Barrackpore (*Rothney*) ; N. Kanara (*Comber*).

Cerceris fastidiosa sp. n.

♀. Flava ; vertex mesonotoque nigro-maculatis, segmentis dorsalibus rufo-fasciatis ; clypeo convexo, porrecto, apice inter carinas duas triangulariter truncato ; segmento mediano area basali sparse punctata.

Long. 11 mm.

Clypeus strongly convex, nearly as long as broad, obliquely depressed from near the middle, and furnished with two carinæ enclosing an elongate triangular and depressed space at the apex, the apical margin very broadly rounded. Cheeks narrower than the eyes at their greatest breadth ; eyes nearly parallel ; second joint of the flagellum distinctly longer than the third. Pronotum not depressed in the middle, rounded at the angles ; mesopleuræ with two very minute spines. First abdominal segment much broader than long, subtuberculate at the base on the dorsal surface ; second ventral segment without a raised area at the base, fifth ventral segment not raised at the apex. Pygidial area sparsely punctured, more than half as long again as broad, the sides almost parallel, broadly truncate at the apex. Closely punctured, more sparsely and shallowly on the abdomen than elsewhere ; enclosed area at the base of the median segment sparsely punctured, divided by a very shallowly impressed line.

Yellow; a large black spot round the ocelli, mesonotum black with four broad longitudinal yellow bands, the margins and central line of the enclosed area on the median segment and a line continued to the apex of the segment black; first dorsal abdominal segment, pygidial area and the other dorsal segments broadly at the base light ferruginous. Wings hyaline, infuscated at the apex, stigma testaceous.

Habitat—Karachi (Comber).

This species somewhat resembles *C. pulchella* Klug, but is without the raised area at the base of the second ventral segment, the form of the clypeus on the oblique anterior portion is different, as is also the sculpture of the enclosed area at the base of the median segment.

Cerceris rhynchophora sp. n.

♀. Nigra, delicatissime punctata, etiam in area basali segmenti mediani; clypeo, fronte, scapo, macula magna post oculos, pronoto, tegulis, scutello, postscutello, segmento mediano macula utrinque, segmentis 1—5 fasciis latis, tibiis tarsisque flavis; alis hyalines, apice leviter infumatis; clypeo convexo, porrecto, nasuto, margine apicali sub rostro bidentatos; mesopleuris haud tuberculatis; segmento ventrali secundo area basali elevata nulla; area pygidiali triangulari, apice acuta.

Long. 10 mm.

♀. Clypeus porrect, convex, produced into a noselike process at the apex, the margin below the process with a tooth on each side. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli a little further from the eyes than from each other; the inner margins of the eyes parallel. Pronotum not depressed in the middle; mesopleuræ without tubercles; second ventral segment without a raised area at the base; first segment twice as broad as long, the abdominal segments broad and scarcely constricted at the base. Pygidial area granulate, of an elongate triangular shape, ciliated at the sides. Very finely and closely punctured, rather sparsely on the scutellum. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Differs from the female as follows: clypeus longer than broad, rounded at the apex, with three small teeth on the margin, and almost flat. The whole insect much more coarsely punctured; the basal area of the median segment shining, finely punctured, with short longitudinal striæ at the base. Abdominal segments constricted at the base; the first segment about half as broad again as long. Pygidial area as broad at the base as long, the apical margin truncate and less than half as broad as the base.

Habitat—Quetta (Nurse). May.

The female is very near *C. euryanthe* Kohl., in the shape of the clypeus and pygidial area, but seems to differ in the much finer sculpture and the proportions of the antennal joints.

Cerceris vigilans Sm.

Cerceris vigilans Sm. Cat. Hym. B. M. IV, p. 454, 1856, ♂.

Cerceris lanata Cam. Jour. Bom. Nat. Hist. Soc. XVII, p. 1009, 1907.

♀. Nigra; margine interiore oculorum anguste, macula post oculos, vertice macula parva utrinque, segmento primo dorsali macula utrinque, tibiisque linea, albis; segmentis abdominalibus 2—5 rufo-ferrugineis; alis fusco-violescentibus; clypeo apice anguste producto, recurvato; mesopleuris tuberculatis; segmento mediano area basali delicatissime punctata; segmento ventrali secundo area basali elevata nulla.

♂. Feminae similis; pronoto utrinque albomaculato; segmentis dorsalibus 5—6 infuscatis; clypeo apice late rotundato, dentibus tribus armato; flagello subtus ferrugineo, fronte albo trilineato.

Long. ♀, 12-15 mm.; ♂, 9-12 mm.

♀. Clypeus a little longer than broad, the apical margin produced in the middle and recurved, the middle produced into a broad rounded tooth with a minute tubercle on each side of it at the base. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum equal in length. Inner margins of the eyes almost parallel; posterior ocelli half as far again from the eyes as from each other. Mesopleuræ with a small, blunt tubercle; second ventral segment without a raised area at the base; first segment nearly twice as broad as long; pygidial area elongate ovate, broader at the base than at the apex, twice as long as the greatest breadth. Closely and rather finely punctured, the enclosed space at the base of the median segment very minutely punctured, clypeus sparsely and shallowly punctured.

♂. Clypeus very broadly rounded at the apex and armed with three broad teeth; apical joint of the flagellum longer than the penultimate and strongly curved; pygidial area more than twice as long as broad, a little broader at the apex than at the base.

Habitat—Almost the whole of the Indian region, excepting Ceylon and the North-West frontier districts. Bingham's description of the female seems to have been taken from a male.

Cerceris leucozonica Schlett.

Cerceris leucozonica Schlett. Zool. Jahrb. II, p. 405, 1887, ♀ ♂.

♀. Nigra, clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, segmentis abdominalibus primo, tertio, quarto, quintoque fasciis latis flavis; flagello fusco-ferrugineo, pedibus flavis, ferrugineo-variegatis; clypeo plano, ad apicem modice angustato, margine apicali

truncato, segmento mediano area basali basi longitudinaliter striata, segmento ventrali secundo area elevata nulla; alis hyalinis, apice leviter infuscat.

Long. 9 mm.

♀. Clypeus a little longer than the greatest breadth, slightly narrowed towards the apex, the apical margin truncate. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, second joint of the flagellum as long as the first and third combined; the inter-antennal carina low, not reaching the base of the clypeus. Cheeks narrower than the greatest breadth of the eyes; posterior ocelli a little further from the eyes than from each other. Mesopleuræ without tubercles. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; fifth ventral segment widely emarginate at the apex, depressed in the middle of the apical half. Pygidial area more than half as long again as the greatest breadth, gradually narrowed from the base and almost pointed at the apex. Deeply and coarsely punctured, more sparsely and shallowly on the abdomen; the enclosed area at the base of the median segment coarsely longitudinally striated at the base, punctured between the striæ, very finely transversely striated at the apex, with a deep median furrow.

Habitat—Quetta (Nurse). June.

Described by Schletterer from Hungary and Bulgaria. Typical specimens are without the broad yellow band on the basal abdominal segment. The entirely black second segment renders the species rather conspicuous amongst other Quetta species.

Cerceris nursei sp. n.

♀. Nigra, nitida, sparse punctata; clypeo, fronte, scapo, genis, vertice macula utrinque, pronoto, tegulis, mesopleuris fascia lata, scutello, post-scutello, segmento mediano macula utrinque, segmentis abdominalibus 1—5 basi anguste nigro, pedibusque flavis, flagello anoque fusco ferrugineis; clypeo plano, apice truncato; segmento mediano area basali nitida, in angulis oblique striata; segmento ventrali secundo area basali elevata nulla.

Long. 9 mm.

♂. Feminae similis, capite thoraceque minus flavo pictis; clypeo concave depresso, angulis apicalibus dente minuto armato.

♀. Clypeus almost flat, much broader than long and broadly truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum a little longer than the third. Cheeks not quite as broad as the eyes; posterior ocelli about half as far again from the eyes as from each other; eyes diverging very slightly towards the clypeus. Pronotum not depressed

in the middle; mesopleuræ without tubercles; second ventral segment without a raised area at the base; pygidial area gradually narrowed from the base, about three times as long as the greatest breadth and almost pointed at the apex. The abdominal segments are not strongly constricted; the basal segment broader than long. Sparsely punctured, very finely on the head and thorax, more coarsely, but shallowly, on the median segment and abdomen; enclosed area at the base of the median segment smooth and shining, with a few oblique striæ in the angles. First recurrent nervure received at one-third from the base of the second cubital cell.

Black; mandibles, clypeus, front, checks, a spot on each side on the vertex, pronotum, tegulæ, an irregular band on the mesopleuræ scutellum, postscutellum, a large spot on each side of the median segment, abdominal segments 1—5, very narrowly black at the base on the dorsal, broadly testaceous brown at the base on the ventral surface, and the legs bright yellow. Wings hyaline, slightly iridescent, with a fuscous cloud at the apex, nervures fusco-ferruginous.

♂. Clypeus as long as the greatest breadth, broadest in the middle almost the whole surface occupied by a concave depression of an oval shape, the apical margin transverse, armed with a small tooth at the apical angles. Apical joint of the flagellum very slightly curved, not quite as long as the penultimate. Pygidial area less than half as long again as broad, truncate at the apex, the sides almost parallel.

Vertex and cheeks without yellow markings, median segment entirely black, the thorax with the pronotum, tegulæ and postscutellum only yellow; femora marked with black.

Habitat—Quetta (Nurse). May and June, 3 ♀, 1 ♂.

Cerceris circumcincta sp. n.

♀. Nigra; mandibulis basi, clypeo margine apicali nigro, margine interiore oculorum latissime, scapo subtus, macula pone oculos, pronoto utrinque, tegulis, postscutello, segmento mediano macula laterali utrinque, segmentis dorsalibus 1—5, ventralibus 2—4 fascia apicali, tibiisque axtus flavis; flagello subtus pedibusque testaceis; alis subhyalinis, apice infuscatis, nervulis fuscis, stigmatibus testaceo; clypeo brevi, apice truncato, depresso; mesopleuris haud tuberculatis; segmento mediano area basali apice punctata, basi striata; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; clypeo convex, nitido, apice truncato; segmento mediano area basali subnitida.

Long. ♀, 10 mm.; ♂, 9 mm.

♀. Clypeus short, slightly convex, shining, nearly twice as broad at the apex as long, the apical margin narrowly depressed. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the

clypeus, the second joint of the flagellum about half as long again as the third, eyes almost parallel; posterior-ocelli about half as far again from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment fully half as broad again as long; second ventral segment without a raised area at the base; pygidial area narrowly rounded at the apex, gradually narrowed from the base, a little less than twice as long as the greatest breadth. Very finely and not very closely punctured, enclosed area at the base of the median segment minutely punctured at the apex, finely striated at the base. First recurrent nervure received a little before the middle of the second cubital cell.

♂. Clypeus convex, shining, longer than broad, truncate at the apex. Antennæ inserted only a little further from the anterior ocellus than from the base of the clypeus, apical joint of the flagellum shorter than the penultimate. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat—Kashmir, 5-6,000 ft. (*Nurse*), May.

Cerceris mellicula sp. n.

♀. Ochracea; fronte circa ocellos, mesonotoque nigris; prothorace, scutello postscutelloque flavis; alis hyalinis, apice infumatis; clypeo leviter emarginato, segmento mediano area basali nitida, area pygidiali apice leviter emarginata.

Long. 9 mm.

Clypeus nearly as long as the breadth at the apex, feebly emarginate on the apical margin, slightly convex, shining, with a few scattered punctures. Head closely but not deeply punctured, the front below the insertion of the antennæ almost smooth. Eyes parallel on the inner margin; second joint of the flagellum distinctly longer than the third; breadth of the cheeks equal to about half of the greatest breadth of the eyes. Thorax sparsely punctured, the scutellum almost smooth; pronotum slightly depressed in the middle; mesopleuræ with a minute tubercle. Median segment and abdomen rather closely punctured; the enclosed area at the base of the median segment smooth and shining, with a shallow median groove, which is continued more deeply to the apex of the segment. First abdominal segment a little broader at the apex than long; second ventral segment without a raised area at the base; apical margin of the fifth ventral segment very slightly raised. Pygidial area half as long again as the breadth at the base, where it is broadest, nearly twice as long as the breadth on the shallowly emarginate apical margin. First recurrent nervure received at one-third from the base of the second cubital cell. Ochreous; the front round the ocelli broadly and the mesonotum black; pronotum, pleuræ, scutellum and postscutellum yellow. Wings hyaline, strongly infuscated beyond the radial cell, nervures black.

Habitat—Karachi (Comber). October.

With this species I associate, with some doubt a male taken at Karachi in considerable numbers by Mr. Comber. It is yellow, with the vertex, cheeks, mesonotum, middle of the median segment and the base of all the abdominal segments narrowly black. Clypeus convex, more than half as broad again as long, narrowly truncate at the apex. Fifth and sixth ventral segments produced into a short spine on each side at the apical angles. Pygidial area about half as long again as the greatest breadth, broadly rounded at the apex, the sides parallel. Length 8mm.

The female somewhat resembles *C. annera* Kohl., but has the clypeus and pygidial area much broader.

Cerceris bolanica sp. n.

♀. Nigra; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento abdominali secundo basi, tertio quintoque totis, quarto apice, pedibusque flavis; alis hyalinis, apice leviter infumatis, venis fuscis; clypeo apice angustato, emarginato; mesopleuris haud dentatis; segmento ventrali secundo area basali elevata nulla; segmento mediano area basali punctata.

♂. Feminae similis; clypeo latitudine latiore, apice rotundato.

Long. ♂, 7 mm.; ♀, 6 mm.

♀. Middle lobe of the clypeus as long as the greatest breadth, much narrowed towards the apex, the apical margin slightly porrect and very shallowly emarginate. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, the second joint of the flagellum only very slightly longer than the third. Inner margins of the eyes parallel; posterior ocelli nearly twice as far from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment nearly half as long again as broad, second ventral segment without a raised area at the base; pygidial area elongate ovate. First recurrent nervure received at one quarter from the base of the second cubital cell. Rather deeply punctured; the enclosed area at the base of the median segment punctured with a longitudinal median groove; postscutellum smooth.

♂. Clypeus longer than broad, rounded at the apex; pygidial area about half as long again as broad; first recurrent nervure received at two-fifths from the base of the second cubital cell.

In both sexes the third ventral segment is yellow, and the flagellum beneath reddish.

Habitat—Quetta (Nurse). July.

This is near *C. rubida* Jur., but in that species the antennæ are inserted nearer to the base of the clypeus, and the sculpture is much coarser. The present species may be identical with *C. vagans* Rad., but the description

of that species is almost worthless for purposes of identification, and there is no figure.

Cerceris baluchistanensis Cam.

Cerceris baluchistanensis Cam. Ann. and Mag. Nat. Hist. (7) XX., p. 88, 1907. ♂.

♀. Flavo-ochracea; alis hyalinis, apice et in cellula cubitali secunda infumatis, venis testaceis; clypeo convexo, latitudine æquilongo, apice late truncato; mesopleuris bituberculatis; segmento mediano area basali sparse punctata; segmento ventrali secundo area basali elevata nulla.

♂. Feminæ similis; flavus; flagello segmentisque abdominalibus apice anguste pallide ferrugineis; mesonoto, vertice, segmentoque mediano basi sæpe nigro-maculatis; clypeo modice producto, apice truncato; mesopleuris haud tuberculatis.

Long. ♀, 12 mm.; ♂, 10 mm.

♀. Clypeus as long as broad, convex, broadly truncate at the apex. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum less than half as long again as the third. Eyes diverging very slightly towards the clypeus; the posterior ocelli more than half as far again from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two small tubercles; first abdominal segment more than half as broad again as long; second ventral segment without a raised area at the base; pygidial area more than twice as long as the greatest breadth, slightly broadened towards the middle, half as broad again at the base as at the apex. Closely but not coarsely punctured, most sparsely on the mesonotum and scutellum; the enclosed area at the base of the median segment very sparsely punctured, with the usual median groove. First recurrent nervure received at one quarter from the base of the second cubital cell.

♂. Clypeus convex, a little longer than broad, shining and very sparsely punctured, produced and rather narrowly truncate at the apex. Mesopleuræ not tuberculate. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the apical joint of the flagellum strongly curved, a little longer than the penultimate. First abdominal segment as broad as long, with a slight depression on the middle of the apical margin; pygidial area nearly twice as long as the greatest breadth, slightly narrowed to the apex.

In both sexes there is a small fuscous spot on the petiole of the second cubital cell.

Habitat—Quetta (*Nurse*). May and June. ♂. Deesa (*Nurse*). August ♂ ♀.

(To be continued.)

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part X.

WITH PLATES D2, D3, AND D4.

(Continued from page 1136 of Volume XX.)

FAMILY—PAPILIONIDÆ—(continued.)

Only one genus PAPILIO.

81. *Papilio helenus*, L., Race *daksha*, Hampson. (Pl. D3, figs. 26 ♂, 26a ♀.)
Male and female *upperside*: brownish-black to rich velvety black. Forewing with four slender lines in cell from base to near end of cell and outer internervular hairy streaks of varying width from median area to near termen, yellow-brown; these latter giving in many specimens a golden-brown appearance in certain lights to the terminal half of wing. Hindwing with a more or less quadrate white spot in interspace 7, one more elongate similar spot in each of the two interspaces below, the three forming a very conspicuous discal white patch with the outer margin zigzag; this is followed by a series of intermarginal more or less imperfect claret-red rings in interspaces 1 to 5 that enclose large, intense black, oval spots; these rings may be obsolescent in the male or even entirely wanting in specimens from the damper regions. The number of the rings is variable also, the tornal one being always present. Cilia black alternated with white. *Underside*: duller opaque black, the forewing generally somewhat less black than the hindwing. Forewing similar to the upperside but the cellular and internervular streaks formed of scales, not hairs, greyish white in colour and much more clearly defined, the latter anteriorly do not reach the terminal margin but form a postmedial band, the upper streaks in some few specimens reaching the apex of the cell. Very occasionally, in the damper regions, the streaked postmedial band is somewhat prominently white at base of interspace 7 (between veins 7 and 8) and there is a corresponding white blurred spot on the upperside of wing. Hindwing: markings similar to those on the upperside but the upper spot of the discal white patch crescentic in shape, the whole patch generally narrower and the

spots that compose it divided by black veins ; the inner marginal series of rings are dull ochraceous-red and only the tornal and the ring in interspace 2 are more or less complete, the rest of the series reduced to a curved sub-terminal line of lunules from interspace 3 to 7 ; in addition there is an inner broad red lunular spot in interspace 2 in continuation of the inner portion of the tornal ring ; both the lunule and inner portion of tornal ring traversed by a line of bluish white scales ; the lunule sometimes continued in interspaces 3, 4 by an ochraceous mark in each to the lower outer angle of white patch. The uppermost spot of the white patch generally with some blue scales on the interval between it and the terminal red ring. The female generally has the rings on the upperside of hindwing and the markings on the underside larger and bolder. Exp. 80-150 mm.

Generally the average size of a male is 130mm., that of a female about 140mm., the latter generally running a little larger than the former.

Egg.—Nearly spherical, flattened where affixed to leaf. Surface finely dented, shiny. Colour orange blotched with red-brown pigment. D : 2mm.

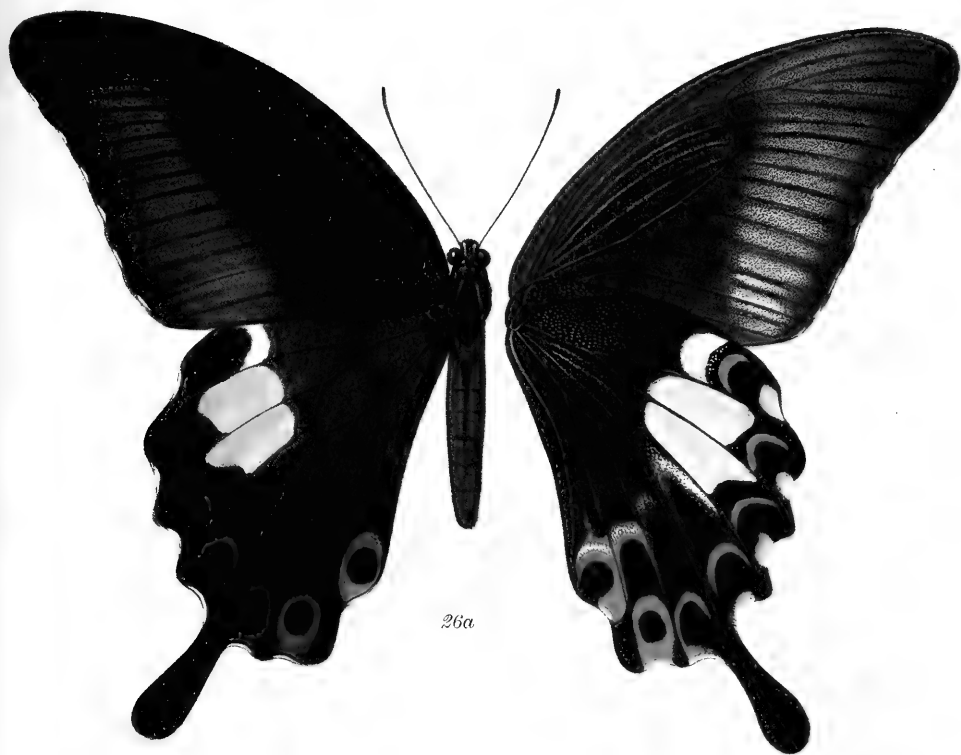
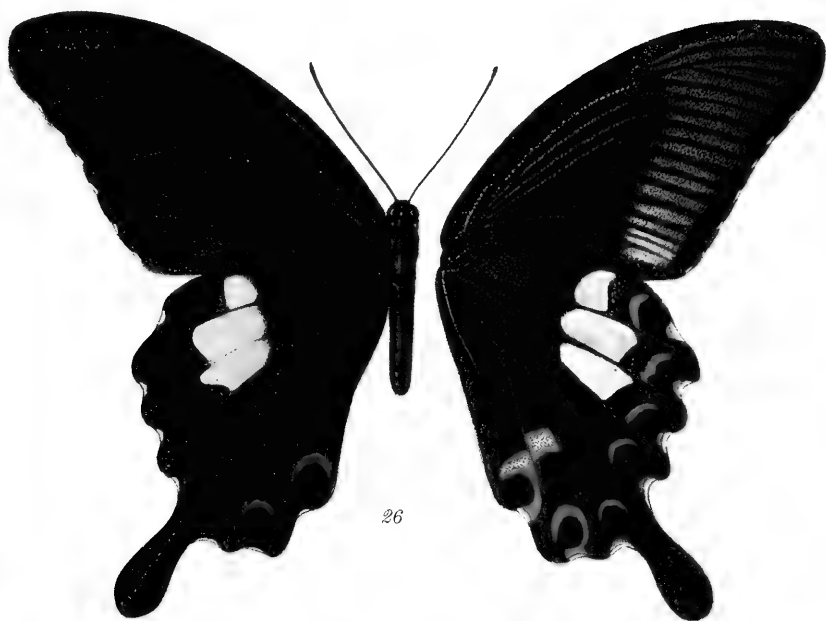
Lava.—The caterpillar is very like that of *P. polymnestor* in colour, shape, and markings. The head is round and soiled watery white, hidden under segment 2 in repose ; exactly as in *polymnestor* in every way including the white dorsal line splitting down sides of clypeus. Segment 2 trapeze-shaped with front margin straight, lateral margins diverging backwards, the angle between the front margin and them rounded, somewhat thickened, without any tubercle ; segments 3 and 4 increasing in width with segment 5, which is the broadest part of the body ; segments 4, 5 flattened on top more or less, there being a crest or ridge running along the front margin of the former, ending laterally in an eye or ocellus, and a less prominent ridge on the hinder margin of the latter, both curved, the one convex forwards, the latter convex backwards and with its extremities curving to close to the eye of the more prominent ridge on each side of the larva, this lower crest continued forward in the lateral region below the eye as a thinner, yellowish line to the front margin of segment 2, bordering the green dorsal portion of larva from the greyish colouring of ventral parts ; the surface included between the ridges or crests is nearly elliptical in shape and shield-like as in *polymnestor*. The shape of body from segment 6 to anal end is sub-cylindrical, the sides somewhat flat and perpendicular to the flat ventral surface ; the anal end is perpendicular to the longitudinal axis of larva behind a white line between the dorsolateral tubercles of segment 13 which are nearer the hinder margin of that segment than the front margin, this white line being continued forward to join the subspiracular line at front margin of segment 12, thus limiting the dorsal green colour from the white of the anal clasper-faces, anal flap, and parts below and behind it. The surface of the larva is velvety and

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

EXPLANATION OF PLATE D3.

Fig. 26. *Papilio helenus*, L., Race *daksha*, Hampson. ♂

„ 26a. „ „ „ „ „ „ „ ♀



THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del.

Hentschel-Colourtype.

smooth looking with a dorsolateral, small, fleshy, white tubercle on segment 13 on the white line; there are no others. Spiracles of ordinary size, oval, fleshy light-brown with fine black border and a thicker black line inside parallel to margin. Colour of larva is a rich grass-green above the subspiracular enamel-white band which starts at base of anal claspers and runs forward to the front margin of segment 7 quite straight; then, getting gradually thinner, on to segment 6 where it curves up to the supraspiracular region, bordering the dorsal green and leaving the ventral watery smoky grey colour between it and the crest of segment 5 protruding upwards in a triangle into the segmental membrane between the two segments 5 and 6; this segmental membrane is black; the anal segment is white mottled with black; the front margin of segment 2 and its continuation backwards to the crest on segment 5 is yellow; the bases of legs and visible ventral portions of segments 2-6 is watery dark-grey; there is a dark black-mottled grey broad band running diagonally across segments 8 and 9, bordered in front by a line running from above lower anterior corner of segment 8 up and back to dorsum in front of hinder margin of segment 9 where it meets the one on the other side; behind it is bordered by a line starting from hinder margin of segment 8 up that margin and then back to hinder margin of segment 9 subdorsally, the band getting narrower on dorsum; segment 10 is grey-mottled with black behind a light line starting at anterior margin of segment 10, curving backwards and up to the subdorsal region of segment 10 where there is a semicircular production of the dark mottling forward on either side of larva, the dorsal part of the complete transverse band formed by the markings on either side being its narrowest part; vertex greyish; true legs brownish; pseudo legs large, thick and fleshy, greyish, marked with two transverse dark lines. The eye of segment 4 is black with a transverse brown line and a yellow-brown border; the crest is finely veined with black between the eyes as in *polymnestor*; the hinder crest is lighter green with slight white markings and violet loops, also as in *polymnestor*. The scent organs are deep flesh-coloured. L: 75mm; B at segment 5: 12mm.

Pupa.—The pupa is very similar in general shape to that of *P. polymnestor*. The front part of the longitudinal axis is inclined at an angle of 90°, slightly more than in that species, to the hinder half; the head-points are perhaps slightly longer as they are certainly stouter and are perhaps also thrown back very slightly; the front slope of thorax is quite perpendicular to the longitudinal axis at that point; the extremities of the greatest width of pupa are perhaps more prominent and are somewhat flattened above and below. The surface is very much rougher, and there are prominent subdorsal tubercles on segments 8, 9 as well as a smaller lateral one and indications of such on segments 10, 11. Spiracles of segment 2 indicated by little semicircles on the surface of the segment with

the common margin of segments 2 and 3 as bases; other spiracles oval light brown in colour with white linear central slit, not small, more or less flush. The colour is ordinarily green with a similar yellow saddle to that described for *P. polymnestor*. If the pupa is against a grey bark or in a cage then it may be variegated with brown and pink, black and grey, white and green all together, in which case there is of course no yellow saddle. L: 45mm; B at segment 7: 19 mm; at shoulders: 6.5mm; L of head-points, 3mm.

Habits.—The larva, when full grown, generally lives in the centre of the upperside of the leaf, lying along the mid-rib always when it is young. Sometimes, when mature, it prefers, like most other *Papilio* larvæ, the stalk of the leaf or a twig. It is slow in its halting movements and wanders to pupate. The young larva is one of those that imitate bird-droppings by the pattern of colouration and its oily look and somewhat irregular surface. The imago deposits its eggs, one at a time, on mature leaves of the foodplant in shady places in heavy jungle, choosing, as a very general rule, small saplings with foliage about 10 to 20' from the ground. Two larvæ are often found on the same little tree with very few leaves left between them at the end of their growth. The pupation takes place on the underside of a twig or strong leaf-rib and the loop is rather long, longer than in *polymnestor*. The yellow saddle adds greatly to the difficulty of seeing the pupa from below and it is always difficult to find amongst the green leaves of the plant where it is formed. The larva wanders sometimes long distances before turning into a chrysalis. The imago is an insect of the jungles and hills and regions of heavy rainfall; it is never found far away from these, but may stray into the plains along the borders. It flies fast, always seems to be in a great hurry, even when stopping to hover for a moment over a flower for food, and is rarely seen at rest. It is fond of the big jungles and keeps entirely to the protection of trees, often very near the ground, never seems to bask in the sun and comes to rest in dull weather on the upper surface of some leaf, often high up in the tops of trees, with its wings held quite horizontal, the upper wing drawn down over the hinder one so as to completely hide the conspicuous white patch on the latter. It is then not very easily seen and the position is evidently assumed for the

purpose of protection from enemies, particularly birds. *P. daksha* is one of the finest butterflies of India in point of size and quiet beauty; it is one of the four really large ones mentioned in these papers and is not likely to be forgotten once seen. The insect is on the wing all the year round but is commonest during the monsoon months. The food plants are rutaceous; it has been bred on *Zanthoxylum Rhetsa*, DC.; *Glycosmis pentaphylla*, Correa; *Citrus medica*, L.; *Citrus decumana*, L.; all more or less evergreen trees and widely distributed in the Indian region with the exception of the first; but there are other species of *Zanthoxylum* that are found in places where *Z. Rhetsa* is not. *P. daksha* is confined to Southern India, the Nilgiris, Malabar and Travancore; its place is taken by *mooreanus*, Rothschild, in Ceylon and *helenus* L., in the Himalayas from Mussoori to Sikkim, hills of Assam, Burma, Tenasserim, Siam, China and the Malay Peninsula, both these differing very little though more or less constantly in small points from *daksha*.

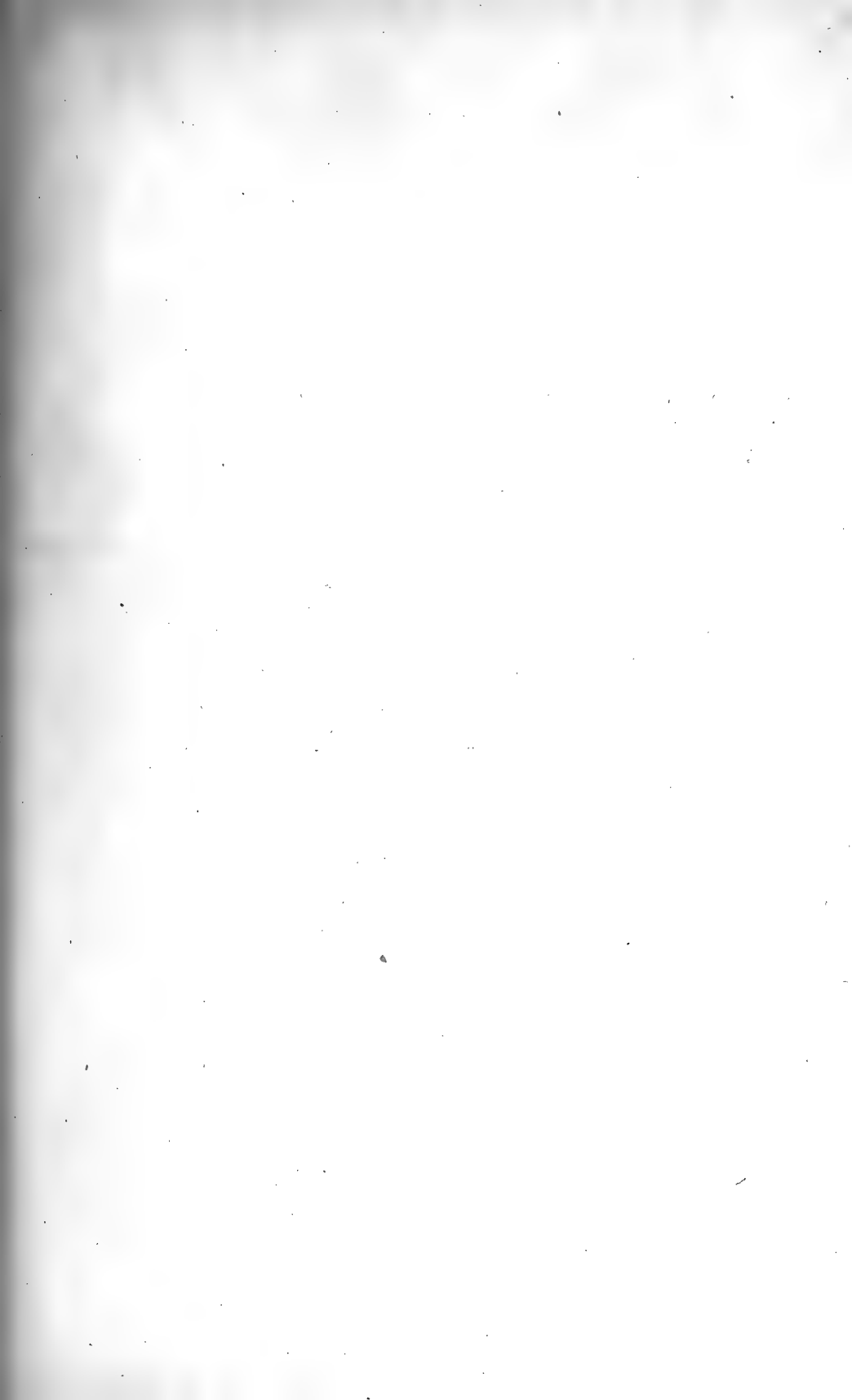
The figures in Pl. D3. have the ground colour slightly too red, the fault being greatly accentuated in the lower or female insect: this latter is altogether too light, females in nature being very nearly as black as males; the picture must have been painted from a faded specimen.

82. Papilio polymnestor, Cramer. (Pl. D4, fig. 27 ♂, 27a ♀).—Male *upperside*: rich velvety black. Forewing with a postdiscal band composed of internervular, broad, blue streaks gradually shortened and obsolescent anteriorly, not extended beyond interspace 6, very rarely into interspace 7. Hindwing: the terminal three-fourths beyond a line crossing the apical third of the cell blue or greyish blue, with superposed, postdiscal, subterminal and terminal series of black spots; the postdiscal spots elongate, inwardly conical; the subterminal oval, placed in the interspaces like the postdiscal ones; the terminal irregular, placed along the apices of the veins and anteriorly coalescing sometimes more or less with the subterminal spots. *Underside*: opaque black. Forewing with an elongate red spot at base of cell; the postdiscal, transverse series of streaks as on the upperside but grey tinged with ochraceous and extending right up to the costa; in some specimens similar but narrow streaks in the cell. Hindwing with five irregular small patches of red at base, the one nearest dorsal margin sometimes wanting; the outer three-fourths of the wing touched with ochraceous but generally narrower than the blue on the upperside, the inner margin of the colour crossing the wing beyond the cell; the

postdiscal and subterminal black spots as on upperside but much larger. In some specimens this grey area is much restricted, the subterminal spots merge completely with the terminal and form a comparatively broad black terminal band. Antennæ, head, thorax and abdomen blackish-brown. Female very similar, but the internervular streaks on the forewing paler, extended into the cell both on the upper and undersides. Hindwing with the pale blue of upperside and the corresponding grey area on the underside paler, generally more ochraceous along inner margin of the area. In some specimens there is a diffuse short red streak in base of cell of forewing on upperside. Exp. 131-156mm. A perfect male has been bred 110mm. The females are generally somewhat larger than the males.

Egg.—The egg is light green when first laid but becomes orange-yellow after some hours' exposure. It is spherical and 1.8mm. in diameter; the surface is smooth.

Larva.—The larva is of the same type as that of *P. polytes* but, of course, much larger. Head more or less round, large, face rather flat; surface finely frosted, somewhat shiny, covered, especially about lower portion, with numerous short, fine, more or less erect, light brown hairs; clypeus small, equilaterally triangular, the apex rounded, rayed transversely, shiny watery green in colour; labrum transverse, whitish, shiny, as is also the somewhat large ligula; colour of eyes glassy white, one or two brown; antennæ and jaws greenish white, both tipped brown; the rest of the head light green with a pure white line down centre, splitting down each side of clypeus and forming thus a much larger triangle than the included clypeus. The body is more or less circular in transverse section, much swollen at segments 4 and 5, the head is generally hidden from above under segment 2 which is trapeze-shaped, the front margin straight, the sides diverging backwards from it in a rounded, somewhat thickened angle where, however, there is no sign of a tubercle (at the angles), the dorsum transversely convex, the dorsal line somewhat ascendant; the anal end is high, falling suddenly, nearly perpendicularly to the longitudinal axis of larva, from a slight raised ridge along middle of segment 13 joining the dorsolateral small tubercles of that segment; the anal flap, forming the major portion of this perpendicular hinder slope, is also trapeze-shaped, ending square and has a triangular, shiny dorsal shield near its extremity; it is closely applied to the broad outer faces of the anal claspers and is coloured like them greyish-white; segment 3 is shaped like segment 2, widening out backwards and sloping slightly upwards; segments 4 and 5 assume dorsally the shape of a semielliptical, somewhat flattened shield, the front boundary of which is formed by a prominent curved ridge, differently coloured to the rest of the body, stretching along the front margin of segment 4 and ending laterally in a black ocellus or eye, the hinder limit being a similar ridge along the hinder margin of segment 5, also slightly curved; both

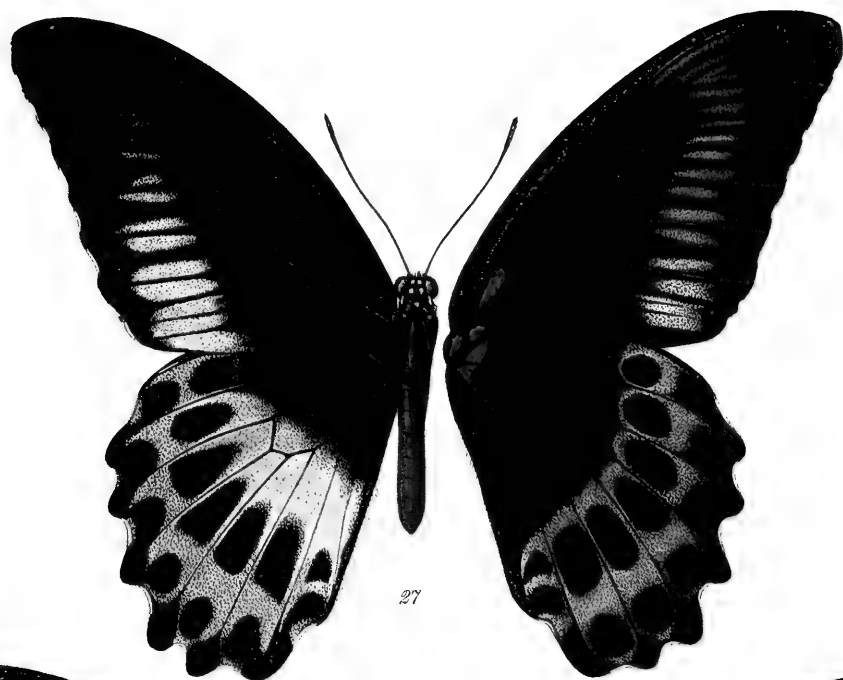


THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

EXPLANATION OF PLATE D4.

Fig. 27. *Papilio polymnestor*, Cramer. ♂

„ 27a. „ „ „ „ ♀



THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del.

Hentschel-Colourtype.

ridges converging towards each other in the lateral region but not meeting; the hinder ridge continued, narrower, as a white line forwards laterally along segments 4, 3 to the front margin of segment 2, thus separating the dorsal green portion of larval body from the watery greenish grey of the ventral parts; after this shield the body decreases gently in diameter to the anal end, the dorsum transversely convex, the sides more or less flattened and perpendicular to the flat ventrum or underparts. The surface of the body is dull and velvety looking but is covered with extremely minute erect hairs when looked at under the lens; there is a small dorsolateral, short, fleshy tubercle near hinder margin of segment 13, coloured white-grey, on a similarly coloured, very slightly raised line which separates the green dorsal colour of the body from the hinder slope, and this line is continued forwards and down, still separating the dorsal green from the lateral grey, to join the white subspiracular line at front margin of segment 12. Spiracles not large, somewhat narrowly oval, light-brown, bordered very finely black with a broader black line inside and parallel to their margins. The colour of larva is a fine rich velvety, darkish grass-green on the dorsal portions with a yellowish shade above the lateral white line of segments 2-5 and above a pure white, subspiracular band starting from the base of the anal claspers and running forwards to the front margin of segment 7 whence, on segment 6, it curves upwards, getting thinner, to lose itself in the supraspiracular region at the front of that segment, leaving a triangle of ventral colour, between it and the swollen hinder ridge of the shield of segments 4 and 5, intervening between the dorsal green as far up as the subdorsal region; indeed, when the larva is stretched, the segmental membrane between segments 5 and 6 is visible right round the larva and the hinder half of the membrane is jet black dorsally and dorsolaterally; the ridge along front margin of segment 4 is ornamented with a fine, thin, black line running in deep open loops from eye to eye and finally, bordered posteriorly with white, encircling the black eye in a forward loop, the anterior part of which is anteriorly bordered with yellow; the eye itself is about 3mm. in diameter, has a dull blue, thin line transversely across its middle and two contiguous, thinly black-bordered, small, enamel-white spots above it towards dorsum of larva; in front of this line of loops and on front of ridge are two parallel, thin, black lines, more or less interrupted throughout their length, with some six thinly black-bordered circles let in between them; the ridge along hinder margin of segment 5 is, like this other ridge, lighter green than the body-colour generally, has no black lines but has the surface of the shield portion of the segment running into its tumidity in little open loops which do not reach its hinder margin and these loops are all coloured violet, fading gradually forwards into the glaucous green of the whole shield; the loops become white towards the extremities of this hinder

ridge; besides all this marking there is, on each side of segments 8 and 9, a broad, thinly white-bordered, thickly white-sprinkled band, limited anteriorly by the white border reaching, from the front margin of segment 8 at the subspiracular white band, up and backwards, crossing the common segment margin 8/9 in the dorsolateral region to meet the posterior limiting line in a curve subdorsally (the bands on either side therefore do not meet over back), this posterior boundary then running down, parallel to the anterior one, to the subspiracular band at posterior margin of segment 8; on segment 10 there is a similar white-sprinkled area occupying the spiracular region on each side, triangular in shape, bordered in front by a white line starting from the front margin at subspiracular band and running back to hinder margin in the lateral region, below by the subspiracular line, and behind by the hinder margin of segment; the front margin of segment 2 is yellowish white; true legs are green; the prolegs also greenish with two transverse dirty lines; the anal claspers are whitish; venter light-green. The osmateria or scent-organs are flesh-coloured. In some larvæ there may be a small subdorsal tubercle in middle of segment 12. There is generally a small blue subdorsal spot near the hinder margins of segments 9, 10; on the former in the band and another below; on the latter segment the place of the blue spot may be taken by a triangular small white patch blotched with blackish; there may be a whitish dot dorsally on segment 4 and a lightish one subdorsally on segment 5. L: 75mm.; B at segment 4/5: 12mm.

Pupa.—The pupa is bent back from about the middle so that the longitudinal axis of the one-half is at an angle of about 80° with that of the other half; the wings ventrally describe a prominent curve along their line of junction and the ends of this curve run straight and evenly to the points of the head forward and the cremastral end backwards; the dorsal outline is correspondingly concave in the middle but convex again in segments 8 and 9, with segment 7 gradually sloping up to 8 from the bottom of the curve, segments 6 and 5 forming the lowest part of it, segment 4 sloping up again towards thorax and, with the hinder half of thorax-length, in a straight line as far as the thoracic apex, whence the front half of the thorax falls suddenly at an angle of about 100° to the hinder slope in a slight curve to its front margin, after which segment 2 is nearly parallel, although slightly concave, to the longitudinal axis of pupa at that point. In lateral outline segment 2 is nearly parallel-sided and in continuation with the exterior margins of the head-points, but gets very slightly broader backwards; the shoulders are somewhat suddenly prominent, after which the pupa is again parallel-sided as far as the constriction where the body-loop passes; after this the wings (and body) are expanded as far as middle of segment 7, the greatest breadth there culminating in a low rounded point; then the breadth again diminishes rapidly to hinder

margin of the segment, less rapidly somewhat to hinder margin of segment 8 and more gradually to the cremastral end of pupa. The head has two diverging straight, thick parallel processes, bluntly pointed, triangular in section, toothed roughly on their inner edges and separated from each other by a triangular sinus; segment 2 has the front margin nearly straight with a triangular sinus in dorsal line; the apex of thorax points forwards and has two ridges, starting at apex subdorsally, running divergently backwards to the hinder margin of the thorax where they again converge, the surface included by them more or less flat; the anal end has the segments 12, 13, 14 cut away underneath more and more backwards so that segment 14 is wedge-shaped, the extreme end quite thin and concavely curved: the sides are perpendicular and the dorsum flat. The front of shoulders is somewhat flattened. The wings are produced at the apices into a triangular point as far as hinder margin of segment 9. The surface is very slightly shiny, not quite smooth and minutely tuberculate on shoulder, head-points the extremities of the extreme width, the flat dorsal portion of thorax as well as on the saddle; there is a small tubercular dot laterally on segment 4 and another in front; there may be indications of tubercles on segments 7, 8, 9 and thorax corresponding to those in *P. helenus*. Spiracles of segment 2 are indicated by narrow linear, light brown ovals between the segment margins 2, 3; other spiracles broadly oval, green, with narrow central brown included ovals; they are flush, that of segment 7 situated at the base of the knob at extremity of extreme width; that of segment 12 blind. Colour is medium grass-green with a yellow green "saddle" bounded anteriorly by the hinder margin of thorax shortly (this hind margin by the way is straight and meets the wing-line in a shallow curve-angle of about 90°), laterally by the dark-green of wing-expansion in a straight line to the points of greatest pupal width, and gradually fades backwards into the green of abdomen; there is blue-grey suffusion on lateral ventral parts of abdomen, on the sides of segments 11-13 and along the dorso-ventral border of ventral parts of segments 3-7 on wings; there is a brown mark along the line separating the saddle from the dark green of segment 4; the suspensory hairs of cremaster are brown. The pupal surface is slightly depressed in the spiracular region of segments 12, 13; there is an indentation just in front of spiracle of segment 2; there is a white dot at extremities of veins of wings. L: 40mm. over all; B at segment 7: 18 mm; B at shoulders: 10mm; of segment 3 middle: 6.5mm.; L of head-process: 3mm.

The pupa is only green when it is formed amongst green leaves. If it is formed on a grey branch out of their influence or in a cage in captivity it may be quite different; often it is variegated, in these latter cases quite wonderfully with white and brown and grey and green and black to suit its surroundings.

Habits.—The eggs are laid always singly on the top of a leaf and generally on a leaf of a certain age. The imago chooses a shady place in the jungles or in a garden, and the leaf chosen is never far from the ground, that is to say, within about ten feet high and always on a plant bearing young leaves. The little larva eats the egg-shell and shortly afterwards makes a seat of web near the edge of its leaf upon which it comes to rest. Later on, when larger, it rests in the middle along the midrib moving, of course, as occasion requires, to a new leaf. When in the last two stages, as soon as it dons the green coat, it sits on stalks, twigs and branches, resting with the body stretched, contracting the first four segments, the face bent down along the leaf-surface. When touched it emits the flesh-coloured osmateria which smell strongly and pungently of the leaves of the food-plant. The pupation takes place suspended from the underside of a leaf-stalk and leaf or from a thin twig, the loop being moderately long. The caterpillar walks in a halting fashion, slowly, spinning web from side to side as it progresses; it travels all over the plant to eat and, at the end, changes its resting place pretty frequently. It does not appear to be much parasitised, though the eggs often suffer in this way. The imago appears after twenty-one days in the most favourable case, the time spent in the pupa varying according to the dryness or otherwise of the weather; in captivity a pupa will often lie over for months. The butterfly is very similar to *P. helenus* in its habits of flight and choice of localities. It, also, does not, usually, fly at any height from the ground though it will occasionally rise to the tops of trees, especially when in search of food; both males and females are commonly found at flowers. The males may often be seen drinking on the moist mud on roads or the wet sand in nallas and rivers at the commencement of the monsoons and in the hot close days that precede them. The species is one of the most plentiful in individuals in the regions where it exists and may be found about at any time of the year. It is however much commoner in the hills at low elevations and in jungle country than in the Plains and is not found in regions of very scanty rainfall. The flight is powerful and quick and generally straight ahead though, when alarmed, the insect dodges with great alacrity and is

not exceedingly easy to catch with a net. Like all others of its class, it will come to decoy---a dead specimen pinned on a leaf or on the ground with its wings spread open---and even to a piece of light blue paper similarly exposed. The resting position is that already described for *P. helenus*, namely, with the wings spread horizontally, the front ones drawn down well over the hindwings so as to partially hide the striking blue colour; a leaf low down in the jungle is generally chosen---a leaf in a protected position with others above to shade it from the sun or cover it from the rain. *P. polymnestor* is found throughout Southern India, the Central Provinces, Bengal, and, as a straggler from the Plains, Sikkim. Its place is taken in Ceylon by a very nearly allied species, *P. parinda*, Moore, which differs in the extent and shade of the blue markings. There are others, varying somewhat in markings, but constant where they occur, confined to Java, Sumatra and Borneo, &c., respectively. *P. memnon* inhabits Java, Nias, Sumatra, Borneo, &c., and has a tailed as well as a tail-less female. Rothschild enumerates four subspecies of this last form from different Malayan Islands, *P. mayo*, *P. rumanzovius*, Eschsch., *P. deiphobus*, L., *P. deipyilus*, Feld., *P. deiphontes*, Feld., *P. ascalaphus*, Boisd., and *P. cenomans*, Godart, some with both sexes tailed, some tail-less or with a short tooth instead of the tail, are given as inhabiting other Malayan Islands and New Guinea. The food-plants of the larva are all belonging to the *Rutaceæ* and it has been found on *Glycosmis pentaphylla*, Corr., *Atalantia* of different species and *Citrus decumana*, L. This last plant is the Pomelo or Shaddock, cultivated nearly everywhere in India. In the forests of Western India, south of Bombay, the commonest food-plant is *Paramigyna monophylla*, Wgt., a large, climbing, armed shrub with a simple leaf and a round, green berry about an inch in diameter which is shortly grey-woolly when young.

Plate D4 depicts the male and female. Both are again too red, the usual fault. The female is far too light both as to ground colour and the blue colouration, in nature the ground colour is nearly as black as the male.

83. *Papilio polytes*, L.—(Pl. D2, figs. 25 ♂ *cyrus* form; 25a ♀ *polytes* form; 25b *romulus* ♀ form).—A polymorphic form.—The male varies slightly

but is fairly constant throughout its range; the female generally with two forms, in Southern India and Ceylon with three, strikingly different in appearance.

Male and female *upperside* black. Forewing: cell and rest of wing with not very prominent, irrorated adnervular bands of pale, yellowish scales and admarginal white specks along the termen. Hindwing: a transverse discal series of elongate white spots in the interspaces 1-7, these spots divided by the black veins and succeeded by diffuse, ill-defined, sparse blue scaling (sometimes obsolescent or wanting in most interspaces) on the postdiscal area; an obscure spot of a deeper black than the ground-colour at the tornal angle surmounted by a lunule of blue scales. *Underside* similar; ground-colour of a duller, more opaque black. Forewing with the cellular and internervular irrorated streaks more prominent. Hindwing: the discal series of white spots and blue scaling succeeded by a subterminal, more or less incomplete series of dingy white lunules and a row of small admarginal spots in the interspaces along the termen; the tornal spot divided from the blue scaling by an ochraceous line (sometimes very indistinct). Antennæ, head, thorax and abdomen black; head and thorax anteriorly on the upperside and head, thorax and abdomen beneath spotted with white; the last with lateral, white lines.

Cyrus form differs:—male *upperside*: the white markings larger, more neatly defined, the tornal spot with an ochraceous short band above it. *Underside*: the subterminal series of lunules are complete, well defined, and vary from white to deep ochraceous-red. Certain specimens have a subterminal band of white lunules on the upperside also (from the Nicobars); others, from the Western Ghats, Kanara, have it of deep ochraceous-red lunules. Female: similar to the male, the subterminal series of lunules on the underside ochraceous. This is merely a form and every phase between it and typical *polytes* is found in Bombay Presidency and in one and the same locality.

Female, *polytes* form.—*Upperside*: fuliginous black on fore, somewhat darker and velvety on the hindwing. Forewing with broad adnervular pale lines on disc, narrower in cell, leaving the base of wing from $\frac{1}{3}$ of costal length to $\frac{2}{3}$ of dorsal margin, and internervular lines and the terminal margins fuliginous black. Hindwing: apex of cell and elongate marks from base of interspaces 2-5 white; lower half of interspace 1 dark-red with blue scales and with a superposed terminal black spot at tornus; the red extends into interspace 2 below the elongate white mark (others have it extending all round the white mark); finally a complete subterminal, transverse curved series of red lunules and admarginal paler red spots often with a narrow terminal yellowish white line beyond them in the posterior interspaces. *Underside* similar; a complete series of admarginal spots along the termen of the hindwing, the anterior spots white.

THE HISTORY OF THE

REIGN OF

CHARLES THE FIRST

BY

JOHN BURNET

OF THE UNIVERSITY OF OXFORD

IN TWO VOLUMES

LONDON

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1724

THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

EXPLANATION OF PLATE D2.

Fig. 25. *Papilio polytes*, L., *cyrus* form. ♂

., 25a. ,, ,, ., *polytes* form. ♀

., 25b. ,, ,, ., *romulus* form. ♀



THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del.

Hentschel-Colourtype.

Antennæ, head, thorax and abdomen black; beneath, the abdomen with lateral rows of white specks. This specimen is typical; but the insect varies a good deal. Often the cell of the hindwing is uniform black to the apex and the number of elongate white marks in the interspaces beyond varies from 2 to 6; even the two may be sometimes very curtailed in extent.

Female, *romulus* form.—Resembles the ordinary female *polytes* form but differs as follows:—Forewing crossed from the middle of cell obliquely to the tornal angle by a broad white band somewhat as in *P. hector*, the margins of the band ill-defined; this is followed by an ill-defined, white patch beyond the apex of the cell. Hindwing with all the discal as well as the subterminal and terminal markings red, including a round red spot at apex of cell. The white band and patch are sometimes much sullied and it varies also in width in different specimens. Exp. 92-114mm; the male generally under 100mm.

Colonel Bingham mentions two remarkable aberrations of the male, both from Southern India. In one the *upperside* forewing had the admarginal white spots along the termen much larger and extended into interspace 8. The hindwing had the transverse discal series of elongate white spots replaced by a series of velvety-black spots darker than the ground-colour of the wing, bordered on the inner side narrowly, on the outer side much more broadly, by ill-defined, diffuse, blue scaling; the black tornal spot in interspace 1 centred by an irregular deep ochraceous red-spot; above this is a quadrate white spot and in a line with it in interspace 2 is a similar but narrower white spot; there is a minute white discal spot in interspace 5. *Underside* similar to the upperside, the ground-colour duller; the markings on the forewing similar, but the terminal white spots still larger. Hindwing: a discal series of extremely elongate streaks in the interspaces beyond the cell; these streaks are rich ochraceous-red mixed with white, but turn to pure white without any red in the anterior interspaces; the streaks in interspaces 1-5 interrupted along their inner halves by a row of spots of a shade darker than the ground-colour of the wing: these spots outwardly bordered by diffuse blue scaling. Exp. 98mm. Procured at Coimbatore, S. India.

The other abnormal specimen, also a male, closely resembled typical specimens but, on the hindwing, the white spots of the transverse discal series are wanting in interspaces 1-3, 7. This gives the insect a superficial resemblance to *P. daksha*.

Egg.—Spherical; hardly perceptibly rough on surface. Colour pale orange, opaque, shiny, smudged with pale-brown. D: 1. 2mm.

Larva (Pl. I, fig. 14).—Is the same as that of *polymnestor* in shape and markings except that segments 4 and 5 are not so swollen; the head is w instead of green, the crests on segments 4 and 5 are yellow, the

ocellus black. There are the usual two tubercles on segments 2 and 13, the former small and triangular pointing sideways and forwards, the latter smaller, pointing straight backwards. The colour is a rich glaucous green dorsally, slightly yellowish on the sides; the bands and markings on segments 7-10 are white, blotched with red-brown or brown, generally spottedly, the ventrum in brownish white suffused with red-brown or brown. L: 40 when at rest and the B: 8 mm. at middle, a little more at segment 4. This is a moderate-sized larva.

Pupa. (Pl. I, fig. 14a.)—Is very similar to that of *P. daksha*, but the apex of the thorax is produced into a short square-topped point which is directed forwards and overhangs the front slope. The colour of the pupa is identical with that of *P. daksha* both when wild and in captivity. L: 31mm; B: 12 mm. at broadest part, segment 7; greatest H: 9 mm. at segment 7.

Habits.—The habits of the larva in all its stages are the same as those of *daksha* and *polymnestor*. The pupation also takes place in the same manner except that the loop is here perhaps not as long as in the other two. The caterpillar is seemingly not very subject to attack by ichneumons though, of course, it suffers occasionally like all butterfly larvæ. The imago flies well and strongly, though it rarely rises far from the ground, preferring the shelter of bushes and thick places in the jungles and along hedges, in gardens, &c.; it eschews open ground though it is found everywhere in India, in the Plains as well as in the hills, in the densest forest in the regions of heaviest rainfall and in the gardens of the driest parts of the country. It is the male that generally attracts attention, darting across a path and diving into a shady bit of shrubbery or into some thick place in the underwood, or stopping for a short moment at some flower for a passing drink. The females are somehow much less noticeable. The reason is probably because they keep more to the shady places, fly slower and are nearly always strictly attending to the business of ovipositing. It is a fact that they fly much slower as a practice though they can rival the male in quickness when necessity arises---when, for example, they are attacked or frightened. The resemblance of the *polytes* and *romulus* form of the females of this butterfly to *P. aristolochiæ* and *P. hector* respectively has been alluded to in these papers before. These last two swallow-tails have a habit of flying about slowly (*pandiyannus*

has it too), when feeding in the mornings and evenings, from flower to flower, sailing along with the wings held over the back at about 45° to each other at intervals. It is to imitate these the better, perhaps, that the females of the present species affect a slower rate of progression than their males. While the protected insects, however, feed mostly, as said, in the mornings and evenings, these others are not addicted to that practice but feed at odd times throughout the day; they are seen generally in the under-wood and shady places looking for leaves whereon to deposit their eggs. The *cyrus* form of the female is nowhere common in the Bombay Presidency as far as is known, whereas both the other forms are equally plentiful. It is probable, indeed, that the form is nowhere very plentiful throughout the range compared to the *polytes* form. The form imitating *P. hector*—*romulus*—is found only in the area frequented by *P. hector*; a very peculiar fact. Another extraordinary thing is that where local forms of *P. aristolochiæ* occur, there the *polytes* form is also modified in a more or less similar way. Things go even further than that: in Celebes where typical *polytes* males do not exist, being replaced by a constant similar but aberrant race called *P. polytes alcinder*, Oberth., the female is only of one type and that imitates a butterfly of the *P. hector* group called *P. polyphontes*, Boisd., which is only found in Celebes and some few neighbouring islands of the Gilolo group; and this although *P. aristolochiæ* exists there. Why? It is difficult to even guess at an answer.

P. polytes is found throughout British India, including the Andamans and Nicobars; extending to Siam and the Malayan Subregion to Celebes; China and Formosa.

The food-plants of the larva are *Zanthoxylum Rhetsa*, DC.; *Glycosmis pentaphylla*, Correa; *Citrus medica*, L.; *Citrus decumana*, L.; and others of the *Rutaceæ*.

The figure 25*a* on Plate D2 has the fore wings much too red; the light parts should be grey or blue-grey. The figure of the male is very good (fig. 25).

84. *Papilio clytia*, L.—There are two forms: one something like a *Euplœa core*, dark-brown with white bordering marks; the other the same with broad white streaks between the veins, imitating *Danaïs limniæ* perhaps; and males and females of both are equally common.

Male and female, *first form*.—*Upperside*: velvety black or soft brown. Forewing with a subterminal series of outwardly truncate or emarginate white spots; the spot in interspace 4 shifted inwards out of line; those in 6, 7, 8 oblique to costa, the lowest and the upper two elongate; this followed by a terminal series of smaller white spots, two in interspace 1, one above the other and two in interspace 8; finally, a single spot between the subterminal and terminal series. Hindwing with a discal series of inwardly conical and outwardly emarginate, triangular, elongate, white spots in interspaces 1-5; a subterminal series of four white lunules in interspaces 2-5, the series continued in interspaces 6 and 7 as transversely oblong, white spots; a prominent, tornal, yellow spot broadly divided across the middle by a bar of the ground colour. The cilia touched with white in the interspaces; sometimes one or more of these specks on the cilia are broad, prominent and yellow in colour. *Underside*: from soft, pale brown to rich, dark, velvety brown. Forewing with the markings as on the upperside. Hindwing with the markings also similar to those on the upperside but the terminal margin beyond the subterminal series of white markings bears a row of comparatively large, very conspicuous, yellow spots, separated from the white lunules by a series of short, transverse, detached spots of the ground colour. Antennæ, head, thorax and abdomen black; the thorax anteriorly and beneath, and the abdomen on the sides, spotted with white.

Male and female, *second form* (*dissimilis*, Doubleday).—Differs from the first form as follows:—*Upperside*: forewing: cell with four streaks coalescent at base and four spots beyond at apex, a long streak in interspace 1a, two streaks with two spots beyond, which are more or less coalescent with them, in interspace 1, a broad streak with an outwardly emarginate spot beyond in interspace 2; similar spots, one at base and one beyond, in 3; a single similar spot in 4; elongate streaks in 5 and 6, and much smaller elongate spots in interspaces 8 and 9. All these streaks and spots cream-white with diffuse edges; subterminal and terminal markings as in the first form. Hindwing: markings similar to those in the first form, with the following differences:—discoidal cell entirely white; discal white streaks longer, reaching quite up to the outer margin of the cell and continued anteriorly to costa by elongate streaks in interspaces 6, 7; two spots in interspace 8 and a slender streak along costa; the subterminal and terminal markings as in the first form. *Underside* similar to the upperside, the cream-white markings slightly larger, the terminal series of yellow spots on the hindwing as in the first form. Antennæ, head, thorax and abdomen with more prominent white spots. Exp. 108-121mm.

The first form is liable to certain variation:—the forewing may have a third (discal) series of one to five markings; it is then variety *easyapa*, Moore; the forewings may be black with an obvious bluish tint in certain

lights; the white spots of forewings are absent or only faintly visible: variety *papone*, Westwood; variety *commixtus*, Rothschild, was received from the Khasia hills and had the three series of spots on the forewing of *easyapa* very feebly marked with two faint spots behind the cell and a streak along the dorsum, white; the discal markings often indicated by white scales, or absent altogether; the hindwing with the apical half of cell, seven long discal streaks reaching the base of respective interspaces and a marginal and submarginal series of spots, white as in *dissimilis*, L. (From Rothschild's "Revision of the *Papilio*s of the Eastern hemisphere, exclusive of Africa.")

There are other races:—*lankeiwara*, Moore, from Ceylon; *panope*, L., from Burma and Tenasserim, extending to Siam and the Malay Peninsula; *flavolimbatus*, Oberthür, from the Andamans. All of these have a *dissimilis* form which does not vary much; the last (*flavolimbatus*) has only the *dissimilis* form.

Egg.—This is spherical, waxy looking and often somewhat uneven on the surface, orange-yellow in colour and about the same size as that of *P. helenus*.

Larva.—(Pl. 1., fig. 13).—Is somewhat of the *hector* type though slimmer, is more or less cylindrical, thickest in the 5th and 6th segments. The anal flap is rather long, semi-elliptical in shape, at an angle of 45° with the longitudinal axis of the larva, with the extremity polished horny-black and reaching triangularly back to the middle of the segment. The head is round, flat-faced, somewhat broadly bilobed, shiny black; the clypeus semi-elliptical, apex rather pointed, centre transversely striate, large; all parts black. Segment 2 is hood-shaped, the front margin straight between two truncated, cylindrical, dorsolateral, fleshy tubercles. Each segment from 2 to 13 has a central, dorsolateral, fleshy, cylindrical, truncated thinish tubercle or process; segments 2, 3, 4 have a similar, much shorter subdorsal one; segments 3, 4, 5 have a similar and super-spiracular one of the same size as the dorsolaterals; segments 5, 6 and 12 have a small, red, subspiracular tubercle of about half the size of the subdorsals of segments 3 and 4. The dorsolaterals of segment 2 are on the front margin, the subdorsals are mere knobs behind these and there is an indication of a spiracular one, small, in front of the spiracle. The body surface is dull and velvety, the tubercles and front of segment 2 as well as the head are set with very short, sparse, brownish-red hairs. Spiracles oval, shiny black with brownish central slits of ordinary size. Colour: velvety black or dark-green with a dorsolateral row of carmine circular spots, one to each segment 3-11 at the base of the respective dorsolateral tubercles (on the upperside); there is also a similar carmine spot at base on the upperside of the lateral tubercles on segments 3-6, 8, 9 and 10 (or where the tubercle should be); a similar subspiracular spot on segments 5-12; a cream-coloured dorsal band

on segments 3-7, narrowing at both ends and flanked by a broad, lateral, similarly coloured band running from the front of segment 2 backwards to meet on the dorsum of segment 8, and continued as a dorsal band on to segments 9 and 10, separated by the segment margins; the bands do not meet in the dorsal line of segment 2 which is black but embraces all the tubercles of that segment which are coloured yellow like it; also a broad, cream-coloured band on segments 11-14 laterally, beginning in a few spots on segment 10 (hinder margin) and finishing about the middle of anal flap on each side of the shiny dorsal extremity; all the tubercles are black except those mentioned above as being otherwise; prolegs shiny black on their outer faces at extremities, dull black elsewhere; true legs shiny black; segments 6-10 soiled flesh colour on venter. The osmaterium is light watery indigo-blue, with the main stem and tips of branches more or less transparent. L: 55mm; B: 11 mm. without tubercles; L. of longest tubercles: 4.5 mm.

Pupa (Pl. I, fig. 13a).—The pupa is cylindrical and much resembles a dead bit of stick, broken off short at the top; or, as it is generally attached to a branch, a dead stump of a secondary branch, sticking out at an angle of 45° from the main one. The head end is shaped and coloured so as to give that impression; the whole is rough and coloured to represent dead bark. The hinder end is closely applied along the ventral surfaces of segments 10-13, which are concave beneath to receive the surface of the cylindrical branch it is attached to by the strong, dorsally convex, trapeze-shaped cremaster which is again set beneath plentifully with short, strong, red-brown suspensory hooklets. The whole pupa is more or less perfectly cylindrical between the bevelled anal end and the "broken-off" fore-end; it is, however, slightly broadened out in the middle and is very slightly constricted about segment 4 where the body-band passes over the surface. The vertices of the head and frons have their dorsal line inclined at an angle of 60° to the longitudinal axis of the pupa; segment 2 has that line nearly parallel to that axis and is rather long, with both margins straight; it is flat on dorsum; the thorax rises nearly absolutely perpendicularly from the hinder margin of segment 2 in its first $\frac{1}{3}$, has the hinder $\frac{2}{3}$ at right angles to this, otherwise parallel to the axis of pupa, or very nearly so, very gradually running down and back to segment 4; the dorsal line of segments 4 to 14 is quite parallel to the longitudinal axis; the front declivity of thorax has the surface very rugose with some deep depressions along the front margin; the part of pupa consisting of the vertex of head and frons is oval in shape, broader than high, with an irregular rugose surface limited by an irregular ridge behind in which are two central depressions, one above the other, the anterior one the larger and deeper; the ventral line from front to segment 10 is parallel to longitudinal axis; the shoulders are very slightly prominent and rugose.

The surface of pupa is dull, rugose and pitted all over with slight tubercular risings to mark the position of the larval processes or tubercles; besides which there is a deep, lateral depression stretching from just behind spiracle of segment 6 backwards above spiracle of segment 7, reaching the lateral tubercle of segment 8. Spiracles of segment 2 are indicated by a circular hole, the bottom of which is lost in darkness; the other spiracles are oval, slightly depressed, with a somewhat prominent central ridge. The colour of pupa is lightish-pinkish-brown, washed with smoky black, especially on the dorsal parts where it obscures the ground colour nearly completely with the exception of the subdorsal region of segments 6 and 7; the flat dorsal portion of segment 2 is light yellowish brown, this colour extending to the perpendicular face of thorax in places and to parts of the head surface in front; the wings are dirty whitish sullied with smoky black. L: 38mm; B: 8mm.

Habits.---The egg is laid on a young leaf or bud and is spherical, yellow in colour; the surface is rather rough. The little larva lives on the upper surface of the leaf, seated on a bed of silk, and is brownish oily-looking, with yellowish and orange-brown markings. The final colouring is taken on only at the last moult; the full grown larva sits in the middle of a leaf along the mid-rib---the younger stages also do this. The larva wanders before pupation and voids the whole stomach, skin and all, before actually suspending itself, shrinking much in the process. The silk with which it manufactures the pad and the body-string is quite black; the latter is of medium length and the pupa is fairly rigid from the cremaster upwards owing to the strong tail-fixing. The butterfly is most plentiful during the monsoon months and lies over the dry months in the pupal stage; if the pupa is formed in November it very often does not produce a butterfly until the April or May following. The full-grown larva does not seem to be attacked much by enemies, perhaps due to its warning colours; the young larva, however, is very liable to destruction, mostly, it is supposed, by spiders; it is certainly parasitised less than any other *Papilio* larva. The butterfly, as said, imitates *Eupleea* and *Danaïs limniace* in its dark and light forms respectively; it even goes so far as to imitate the danaine flight when disporting itself at its ease. It is, however, one of the fastest of all the *Papilios* when it chooses, as when it is alarmed

and wishes to escape danger or when it chases another insect of its own species in the way of sport. It is fond of circling round the tops of the hills or peaks in the jungles, well above the trees and will keep for hours on the wing under such circumstances, given a warm, fair day in the monsoon months. Half a dozen or so seem to monopolize a particular hill-top, rarely more; and then nearly always the dark form; *dissimilis*, be it from the fact that it is, perhaps, the less common form, does not often join in. It is occasionally present also, but always in fewer numbers. The butterflies sail lazily about most of the time, round and round, in curves and circles, except when every now and again one takes it into its head to chase another and then it is that the quick flight is most noticeable. They dart away, flying often straight up into the sky and are lost to view in a very short space of time; they fly nearly as fast as the larger *Charaxes*, the fastest of all butterflies. Typical *P. clytia* in both forms is found in the Himalayas from Kangra and Simla to Sikkim; Assam; Central and Southern India. It is not by any means a rare butterfly within its limits but may be mistaken for *Euploea core*, *coreta* or *kollari* or, in the *dissimilis* form, for *Danaus limniace* as already remarked. It rests with its wings closed over the back like those insects, though sometimes it assumes the ordinary *Papilio* position of holding them horizontal, the upper slightly covering the lower. It is fond of the sun and is in no wise afraid of facing open spaces; but is confined more or less to the hilly parts of jungle country. The food-plants of the larva are all of the family *Laurineæ*, embracing the Laurels, Cinnamon, and other aromatic-foliaged trees. Some of the species of trees it has been bred on are *Alseodaphne semicarpifolia*, Nees; *Cinnamomum zeylanicum*, Blume; *Litsea chinensis*, Lam. (*sebifera*, Pers.); all three very common in the Bombay Ghats; the first, a very tall evergreen species, found occasionally in deciduous forests also but confined to the western parts of Peninsular India; the last spread throughout the hotter parts of India, Ceylon and, through the Malay Islands, to Australia; the second with a similar distribution as the last except that it is cultivated in the Malay Islands. Cinnamon

is easily known by its three-veined leaves and its unmistakeable cinnamon-smell and is one of the prettiest trees in the evergreen jungles where its young leaves sometimes light up large areas with their brilliant reds of all shades from the palest yellow-pink to the brightest crimson.

85. *Papilio paris*, L.—Male *upperside*: black, irrorated with dark-green scales which, on the outer portion of the forewing, coalesce and form an incomplete, postdiscal, narrow band. Hindwing: the irroration of dark-green scales does not extend to the costal margin and is interrupted posteriorly by a broad postdiscal area on both sides of which the green scales coalesce to form narrow diffuse bands; a conspicuous, upper, discal, shining blue patch occupies the base of interspace 4 and outer portions of interspaces 5 and 6; this patch is variable in size and in many specimens extends narrowly below and above into interspaces 3 and 7 respectively, its outer margin is uneven, its inner margin evenly arched; a prominent claret-red, largely black centred ocellus at the tornal angle, its inner margin with a transverse, short, violet-blue, superposed line; in many specimens an obscure, claret-red, subterminal lunule in interspace 7. *Underside*: opaque black; bases of both fore and hindwings up to basal half of cell in fore and up to apex of cell in hindwing, with an irroration of yellowish scales: also present, more obscurely, on the subterminal area in both wings. Forewing with a very broad, elongate triangular, pale area that does not extend to the termen, formed of internervular, broad, very pale, ochraceous white streaks, short near the tornus, gradually longer up to the costa. Hindwing: a prominent, subterminal series of ochraceous red lunules traversed by short violet-blue lines; in interspaces 1 and 2 and sometimes in 3, these lunules are formed into more or less complete, largely black centred ocelli by the addition of an admarginal portion of the red ring. Cilia conspicuously white in the interspaces. Antennæ, head, thorax and abdomen black, the latter three sprinkled with green scales above. Female similar, somewhat paler and duller. *Upperside*: forewing with the green postdiscal band shorter and still more incomplete. Hindwing with the upper discal patch smaller, often green and not blue, the red, subterminal lunule in interspace 7 always present and more prominent than in the male. *Underside*: similar to that of the male, but the tornal and subterminal markings generally formed into more or less complete ocelli. Exp. 106-132mm.

The species does not seem to have been bred. It is found in the Himalayas from Kumaon to Sikkim; Nepal and Bhutan; the hills of Assam, Burma and Tenasserim, extending to China, Siam and the Malay Peninsula. As it is very common in some of the places where it exists in the Himalayas it is mentioned here, being sure to attract attention

wherever seen. It does not generally come below 3,000' above sea level.

86. *Papilio tamilana*, Moore.—Very closely resembles *P. paris*, described above; but, on the *upperside*, the upper discal patch on the hindwing is of a paler, more metallic blue and very considerably larger; it extends from interspace 3 well into interspace 7, from the apex of the cell into interspaces 3, 4 and 5 and from the middle of interspace 6 much further towards the termen than in *paris*. *Underside* similar to that of *paris*, but the transverse, postdiscal, pale band on the forewing is conspicuously narrower and curved inwards toward the costa. Antennæ, head, thorax and abdomen as in *paris*. Exp. 116-134mm.

Egg.—The egg is rather small for the insect; it is perfectly spherical, except that it is slightly flattened where attached to the leaf or stalk or flower bud, &c. It is somewhat shiny, superficially pitted as seen under a lens; translucent light-green when first laid, soon becoming more opaque and spotted-blotched here and there with brown-red, which colour has a subcutaneous aspect. Diameter: 1.5mm.

Larva.—In the first stage, on emerging from the egg, it is very like any other larva of the *polymnestor-polytes* group. It is swollen in segments 3, 4, 5 and has the usual dorsolateral long, fleshy, conical spined tubercle on the front margin of segment 2 and on hinder margin of segment 13; a smaller one in middle of segments 3, 4, 5, 12; a still smaller one in middle of segments 6-11; a supraspiracular, very small one on all segments except 13 with the exception of segments 3, 4 where these are as large as the dorsolaterals of the same segments; the dorsolaterals and supraspiraculars of segment 5 are very little longer than the corresponding tubercles of segment 3; besides these there is a subdorsal tubercular spot on segments 3-12 bearing a single, erect hair; there are also the usual subspiracular, tubercular, hair-bearing spots, as well as one on the base of each leg or in that position of the legless segments. The head is roundish, slightly bilobed, flattish on face, set with erect, short spines all over, shiny black except on vertex where it is greenish-ochreous; clypeus rather large, triangular. Colour of body is dark olive-green with the dorsa of segments 8-11 ochreous, segment 7 whitish, with three included spots of body-colour arranged in a triangle and with the white reaching on to segment 6 laterally; dorsa of segments 4, 5 greenish-ochreous; all tubercles ochreous, those of segments 12, 13 whiter; the spines of dorsolateral tubercles light, of subdorsal, supraspiracular and subspiracular tubercles black. L: 7mm.; B: 1.25mm.

2nd stage.—The larva has all the tubercles of the first stage, but the dorsolateral ones are relatively reduced in size: that is, although the larva is larger, these tubercles are still the same size; the spiracular spots are also smaller proportionately; the subdorsal spots remain about the

same but have lost the spines as have also all the spiracular spots with the exception of those on segments 3, 4, 5 which are, however, now covered with very short, erect hairs. The surface of the larva is covered, not very densely, with minute, erect, light hairs. The colour is very much the same as in the first stage except that the head is now green (and without spines or hairs); the lateral regions of segments 7-10 are obscurely white, spotted about the spiracular area; the prolegs are whitish; the dorsal white marking of segment 7 is more perceptible now where it stretches forward laterally on to segment 6, and there is a dorsolateral streak-continuation backwards on to segment 8; segment 7 has still got the three included spots of body-colour on the white. L: 9mm. towards end of stage, 10mm. at end; B: slightly over 2mm. to 3mm. at end of stage.

3rd stage.—The dorsolateral tubercles of segments 2, 12, 13 still persist, only actually very slightly larger than in last stage; those of segments 3, 4, 5 are mere tubercular spots; the subdorsals of segment 2 are proportionately the same size as in the first two stages and the supraspiraculars of segments 3, 4 are not larger than in last stage; there is no sign of tubercles on segments 6-11 except just an indication of the dorsolateral ones. The head is green with a slight brownish tinge, covered with minute, light-coloured hairs; the eyes are black. The surface of the body is somewhat shiny greasy-looking and is covered plentifully with erect, light hairs so minute as to be only just visible under the lens. Spiracles oval, flush, light brown, of ordinary size. Colour of body is darkish green, somewhat ochreous on segments 2-5, especially on latter half of segment 5, segments 12, 13 and on dorsa of segments 8-11; a distinct white, subspiracular band from segment 7 to segment 10; the white marking of segment 7 reaching up as far as dorsolateral line, occupying the whole width of segment, stretching forward slightly on to segment 6 in spiracular region and backward on to segment 8 in a dorsolateral short line. L: 13 mm; B: 4.75 mm. when at rest.

4th stage.—The dorsolateral tubercles of segments 2, 13 still persist, those of the latter much shortened and blunted; those of segment 12 are reduced to tubercular spots; all tubercles of segments 2-5 exist as in last stage, but are all reduced to spots. Head same as in last stage except that it is greener and, of course, larger. Surface of body dull, except for the shiny tubercular spots. Spiracles rather longly oval, shiny, yellow-brown. Colour of body olive-green spotted with yellow, especially on hinder half of segment 5; segment 6 brighter green; segments 12, 13 nearly completely yellow as well as the tubercles; anal flap and prolegs whitish; white subspiracular band from segment 7 to anal end with the spiracular region above it greyish; marking on segment 7 white, reaching as far up as in 3rd stage, produced forward on to segment 6 as far as, and including, the spiracle, but not backwards on to segment 8. The

osmaterias are red-orange in colour. There are light-blue spots where the dorsolateral tubercles of last stage were one to each. L: 20mm; B: nearly 7 mm. when at rest. The larva stretches, when moving, to 25mm.

Last stage.—All tubercles have now disappeared except those on the hinder margin of segment 13, and these even are now reduced to very small, convex, minutely haired knobs; they are situated on the green colour of the upper parts of the larva, just above a yellow line along the hinder margin of the segment; this hinder margin is thickened and is in a plane at right angles to the rest of larva and overhangs the rather large, broad anal flap, which is in a parallel plane to it; this flap is whitish in colour with a square-cut end. The head is nearly round, slightly higher than broad, with a dull surface covered with minute, semi-appressed white hairs; the clypeus is of ordinary size, triangular in shape, with a white linear border and rounded apex; the colour of head is green, the eyes black, the antennæ shiny-transparent whitish. Segment 2 is trapeze-shaped, the front margin slightly longer than the sides, the hinder margin longest; the breadth of body increases rapidly to segment 5/6 where there is a thickening or swelling along the hinder margin of segment 5, not very pronounced, however; after this it decreases gradually to the square end which is practically between the tubercles on hinder margin of segment 13. The surface of larva is dull, smooth and soft-velvety looking. Spiracles are of ordinary size, flush, oval, body-coloured, with white central slit and fine brown border. The colour of the body is a fine bright grass-green, plentifully speckled with yellow, especially on the hinder margins of segments 6-13; with a white, supra-spiracular band from segment 5/6 to anal end; an indication of a yellow diagonal line from front margin of segment 8 back and up through the spiracle to the subdorsal region on the hinder margin; below which line the speckling of yellow is absent; on the same region of segments 9, 10 the yellow speckles are grouped into patches to some extent, suggesting bands; the segmental membrane between segments 5, 6 is broadly velvety black, hidden in repose; there is a fine black, supra-spiracular line from just before spiracle of segment 2 running back on to segments 2 and 3, above which the body is white, but only for a short space, then yellowish, losing itself in the green of the dorsal parts; the white is continued back in a curve over dorsum along the hinder margin of segment 5 (along ridge) and the green of the dorsum in front of this ridge is speckled white forwards for the distance of half the width of segment; the front of segment 2 is yellowish; there is a long, finely black-bordered area along dorsal line of segment 4, narrow and constricted twice in its length and, on the same segment, a rather small ocellus or eye with a white central dot, just above the supra-spiracular white band, contained in the hindermost and lowest loop of a fine black line running, just along the upper border of the white band from the front of segment 3, back to just behind

middle of segment 4 (where it loops to contain the eye); thence this line curves up, forming two other loops, towards dorsum to the dorsolateral region where it bends forward towards head of larva for a short distance then down towards venter, making a large open loop over the ocellus and finally runs forwards, parallel to the starting portion, to front margin of segment 3; the starting point of this fine line is connected with the fine black line bordering the underside of the abovementioned white band which, later on, runs along the ridge of segment 5; the part of the body below this white band on segments 2-5, the belly or venter, the anal flap and prolegs are all a very light, rather watery-green with a bluish shade in it. The black band on segmental membrane behind segment 5 is bordered posteriorly by bluish on the membrane. L: 50mm. when slightly stretched, less when at rest, more when moving; B: 13mm. at middle of segment 5, the broadest part.

Pupa.—The pupa is like that of *P. buddha*, the curve of ventral line being very strong, so that the line from centre of ventral line of wings to head is inclined at an angle of nearly 90° to that from the latter point to cremaster; in the dorsal line the angle between the corresponding lines (having their junction in segment 4) is 170° ; the thorax is rather short, convex, the lateral outline of the convexity being a curve less than a quarter-circle: there is no suggestion of an apical protuberance to thorax; the head-points are stout, not long, round-topped and compressed dorsally and ventrally, divergent, and slightly separated at base; the lateral outline of pupa from base of head-points is parallel-sided as far as front margin of segment 3, broadening out in a gentle curve to hinder margin of segment 4 where the body-loop or suspending-thread is fixed, and still more again to middle of segment 7 in a stronger curve, whence the outline decreases in breadth to cremaster; the dorsal line of abdomen is only slightly curved; the dorsoventral edge of pupa from shoulder to segment 7 is rather sharp; the constriction where the body-loop comes is laterally strong, dorsally moderate. The cremaster is that of the ordinary type for *Papilio*. The surface of the body is dull, shiny only where the intersegmental membrane is visible, smooth; under the lens it is slightly rugose. Spiracles of segment 2 are indicated by a slightly depressed, small, semicircular space on the surface of segment 2 of a dark-green colour; the other spiracles are oval, raised, rather large, green, with curved, light brown-pink, central slits. The colour of the pupa is rather dark glaucous-green on the wings, light greenish yellow dorsally throughout, light yellowish green ventrally on abdomen; a broad, yellow, dorsal band from cremaster forward to segment 4/5, continued forwards by a brown-pink line as far as front margin of segment 2; dorsoventral edge yellow; a dark dorsolateral spot on centre of segments 3, 5, 8; there is a small dorsolateral depression on segment 2. L: just over 40mm.; B: nearly 18mm. at middle of segment 7; at

shoulders: just over 10 mm; at points of head-points: 7 mm; H. at apex of ventral curve: 13 mm.

Habits.—The eggs are laid singly, either on the top of the leaf or on the underside and always, it seems, on leaves of a certain age; sometimes on flower-stalks also. The small larva emerges in the usual way and sometimes eats a little of the egg-shell; then makes a silken nest to lie on near the edge on the upper surface of the leaf; when larger it lies, as is usual with most *Papilio* larvæ, at the point of the leaf, along the midrib, its head directed towards the stalk; it rests with the front segments contracted and the head drawn under segment 2, which makes it look very broad and humped about segments 4 and 5. It pupates in the ordinary way after wandering, but it does not ordinarily wander far; the tail suspension is strong, the body-loop fairly close. As a general rule, it retires high up a tree, often among the flower-stems, and the pupa is always well hidden by overhanging leaves. The imago emerges within 25 days after pupation and is very active, often flying if disturbed before its wings are properly dry. It generally emerges just at day-break. The larvæ are commonest in the months of September and October; in fact it is only at that time of the year that they have ever been found, notwithstanding much seeking in other months. Fully 90 per cent. of the eggs are ichneumonated; the larvæ are much subject to attack from birds, ichneumons, flies, &c. The pupæ often die just before the butterfly emerges.

This is, perhaps, the finest and most striking of all the butterflies likely to be met with in the Hill Stations of the Bombay or Madras Presidencies above 1,000'. It is not found below that level except very occasionally, neither is it found anywhere in the plains, not even along the borders. It is a denizen of the thickest jungles and frequents the evergreens of the hills south of Bombay city. Its distribution is given as "South India; Kanara, Malabar; Nilgiri Hills" by Rothschild, and Colonel Bingham adds "Travancore." It is plentiful in the District of North Kanara from the sea-shore (the hills come down to the sea in places) inwards, especially so in the monsoon months when, in favourable places, as many as half a dozen may be seen on the wing at

once. The insect is fond of the evergreen jungles as already remarked and there it delights to fly in the intervals of hot sunshine along roads, paths and the borders of clearings; it rises high amongst the tree-tops but often descends to within a few feet of the ground on the edges of openings and summits of hills where the jungle is more or less scrubby, flying with a rather weak wing-stroke but in the ordinary *Papilio* manner, stopping at an occasional flower to feed, circling round the foliage of shrubs surrounding its food-plant or diving down into dark nallas over rippling streams to emerge again into sunshine on the other side. This is true of the male, but the female, curiously enough, is rarely seen. Curiously enough, because, in breeding from the caterpillar, rather more females are obtained than males. Probably the female attends more diligently to business while the other sex sports about in the intervals of courtship, like most inferior masculine creatures. During some ten years of collecting, only two females were caught as compared with dozens and dozens of males; and one of these had only just emerged from the chrysalis for its wings were hardly ready for flight; the other was captured sitting on a leaf by the roadside in the characteristic position with the forewing hiding the brilliant peacock-blue spot of the hinder one. In those days a female *tamilana* was a red-letter event, for the larva had not been yet discovered. And that was not for want of searching either. The history of the search and final discovery after twelve years would afford an excellent example of the difficulties sometimes experienced in learning the life-histories of insects. The food-plant of the larva is *Evodia roxburghiana*, Benth., a moderate sized tree growing in the evergreen forest regions of the Western Ghats south of Bombay. It belongs to the *Rutaceæ* and the leaf has the characteristic smell belonging to that family of plants; the flowers are small, arranged in many branched bunches from the axils of the leaves, plenty of them when the tree is in flower at the end of the monsoon; the leaf is rather large, soft, divided into three leaflets, the whole with a long stalk. *Evodia* as a genus is found throughout India in the hills and extends through Burma to the Malayan Region and Australia.

Butterflies that bear a resemblance to *paris* and *tamilana* are some forms of *P. bianor*, Cram. from China as *P. maacki*, Men., a green-suffused form of the typically black *bianor*; *P. polycctor*, Boisd. from Cashmere, Afghanistan and Nepaul and its race *P. ganesa*, Doubl. from Sikkim, Assam, Tonkin, both with the green-blue patch on hind wing developed; *P. arcturus*, Westw. and *P. krishna*, Moore, both from Assam and Sikkim, both very like *paris* but having the green patch more circumscribed; and *P. arjuna*, Horsf. from Java and Sumatra.

(To be continued.)

BIRD NOTES BY THE WAY IN KASHMIR.

BY

MAJOR H. A. F. MAGRATH.

A short trip, much favoured of tourists in Kashmir in July and August, and one which has perhaps often been described, is that from Pahlgam, the well known camping resort in the Liddar Valley, to Sonemurg in the Sind Valley *via* the Yem Her Pass (14,000 feet). To the field naturalist or ornithologist, who undertakes it for the first time, this trip is full of interest, for, except in the vicinity of the pass, the parts he traverses are perhaps the most "birdie" bits in Kashmir. Among my various rambles in Kashmir this year (1911) this was perhaps the most enjoyable.

My leave did not commence till the middle of July and when I arrived in the Liddar Valley the breeding season was approaching its close. Owing to the absence of rain or storms of any severity this summer the season appeared to be a most successful one and young fledglings were to be seen everywhere. Warblers (*Phylloscopi* and *Acanthopneuste*) simply swarmed in the forests and many other kinds of birds were in great abundance, notably the following species:—

The Crested Black Tit (*Lophophanes melanolophus*).

The Himalayan Whistling-Thrush (*Myiophonus temmincki*).

The Kashmir Wren (*Anorthura neglecta*).

The Himalayan Tree-Creeper (*Certhia himalayana*).

Brook's Nuthatch (*Sitta kashmiriensis*).

The Sooty Flycatcher (*Hemichelidon sibirica*).

The Whitecapped Redstart (*Chimarrhornis leucocephalus*).

The Plumbeous Redstart (*Rhyacornis fuliginosis*).

The Dark Grey Bushchat (*Oreicola ferrea*).

The Indian Bushchat (*Pratincola maura*).

The Eastern Meadow Bunting (*Emberiza stracheyi*).

Hodgsons Pied Wagtail (*Motacilla hodgsoni*).

The Himalayan Pied Woodpecker (*Dendrocopus himalayensis*).

The Common Sandpiper (*Totanus hypoleucus*).

Pahlgam itself is full of bird-life in summer and there were many inducements to halt so I stayed here till past the middle of August. On the Liddar stream at this place I was fortunate in coming across the Ibis-bill (*Ibidorhynchus struthersi*), a bird new to me. There were four or five frequenting a shingly bit of the river bed below the visitors camping ground which I felt sure were a pair with a fully fledged brood. If hatched in May the young would have been, at most, fully grown by the time I met with them. In habits the Ibis-bill differs little from the Sandpipers and allied waders, but in some it approaches the plovers. In the evenings they were often to be seen feeding and probing for worms on the short grass by the river during which they would run for a few steps and then stop much

as the plovers do. When watching them one morning I also noted a rather characteristic and almost "cinline" habit of wading breast high into fast flowing water and dipping the whole head and neck under water, picking up food of sorts from the bottom. The Sandpipers act similarly, but not in such a dipper like manner and in such heavy water. I was much disappointed in not hearing any notes from these birds, but if they uttered any low notes in my presence, these were entirely drowned by the roar of the stream. On one occasion I thought I heard a loud monosyllabic whistle from one of the birds flying down stream, but there were such a lot of Kashmiris about herding ponies and cattle, an occupation which appears to necessitate a lot of whistling, that I could not be positive the sound proceeded from the Ibis-bill. Females or at any rate the young do not appear to have any black on the face.

A little bird not uncommon in the middle Liddar and Sind Valleys this year and one which I had not noticed, on a previous visit to these parts, was the handsome Indian redbreasted Flycatcher (*Siphia hyperythra*). Its habits are precisely those of its european congener (*S. parva*) and it has the same vigorous jerk of the tail above the line of the back.

Another flycatcher, fairly common in the same parts as the last species, was the Rufous-tailed Flycatcher (*Alseonax ruficaudus*).

Unlike *Muscapa*, and *Hemichelidon* and other genera of the family this little flycatcher rarely if ever returns to the same perch after catching its prey, but flits from branch to branch in doing so. If *S. hyperythra* flies into the tree where *A. ruficaudus* is hawking the latter drives the former out.

Leaving Pahlgam on the 18th August Liddarwat, the road to which lies through lovely scenery, was reached in 2 easy stages. Half way at Aru (8,300 feet) I saw a pair of Rufous-backed Shrikes (*Lanius erythronotus*), a record elevation, as far as my observations go, regarding this species. I may here observe that the note of anger or indignation which this shrike is not infrequently heard uttering from the middle of a thick shrubor tree especially in the breeding season has recently struck me as bearing a very close resemblance to the note of the Corncrake (*Crex pratensis*) heard in the distance.

At Liddawat 9,500 feet above the sea and 2,000 feet higher than Pahlgam, the woods were teeming with bird-life.

Two interesting species met with were The Orange Bullfinch (*Pyrrhula aurantiaca*) and The Red-browed Finch (*Callacanthus burtoni*).

The former is not very uncommon in this part of Kashmir and after once getting to recognise its notes I became well acquainted with it. This beautiful little bullfinch has much the same habits as our home "bully," and a somewhat similar loud piping call note. A note of communication kept up while feeding is soft and pleasing, resembling the syllable "tew" and often changing to a double note like "tewtyä" "tewtyä." What was evidently the song or part of it I heard at Sonemurg. A most distinctive

one, it commences with the aforementioned syllable "tew" uttered in a loud and melodious tone followed by a rapidly repeated metallic trisyllabic note like "tyätlinkä-tlinkä." The Orange Bulfinch must be a late breeder for a male I shot on 19th August had the testes as big as No. 2 shot and I almost invariably found these birds in pairs. On one occasion only was there a young bird with a pair. Colonel Ward's Collectors, I believe, took eggs and found nests late in August. I generally met with this species just in or on the edges of forests and often feeding on the catkins of the Himalayan birches. 10,500 feet was the maximum elevation at which they were seen but they probably wander on occasions up to tree limit.

The Red-browed Finch (*Callacanthus burtoni*) was not uncommon between 9,000 and 10,000 feet at Liddarwat and at the same elevation in the Sind Valley. The position accorded this genus in the family is somewhat puzzling to comprehend. In the straightness of the bill and to some extent in plumage it may have affinities with *Carduelis*, but in the thickness and heaviness of the former it certainly can have none, neither, as far as my observations go, has it in habits. To me the latter appear more akin to those of the Grosbeaks. It hops about the forest undergrowth picking up seeds in just the same assiduous manner as The Black and Yellow Grosbeak (*Pycnorhampus icteroides*). But from *Pycnorhampus* as well as *Carduelis* and unlike most other members of the family it differs in being, as far as I have noted, solitary or non-gregarious, for I invariably met with these finches in pairs or singly. Forest and often dark forest appears to suit their tastes and in such situations I generally found them feeding on seeds of a succulent undergrowth and not particularly resenting my presence. When startled they flew into the nearest tree and remained not at all shy, eyeing one inquisitively.

A bird shot at Liddarwat on 20th August had the testes as big as No. 2 shot. This was one of a pair, and the behaviour of the female on her mate being killed, was precisely that of a female crossbill (*Loxia curvirostra scotica*) which lost her mate in similar circumstances in Scotland last year. She hovered over the spot reiterating a loud and very plaintive double note resembling the syllables "twêeyeh" (the 1st syllable pitched highest) and following me for some yards in the branches overhead after I had picked up and carried away her dead mate.

The ordinary call note of this species is a loud and pretty "twee," occasionally a loud double song note like the syllables "üh-eh" (the second pitched a $\frac{1}{2}$ tone higher) is uttered. At Sonemurg one day after watching and listening to a male, who shortly disappeared among the branches, I shot a missel thrush (*Turdus viscivorus*), which not being killed outright, uttered loud screams as it fell fluttering down the forest hillside. Immediately a Red-browed Finch, undoubtedly the one I had been observing, together with another, probably its mate, appeared in a tree overhead and both utter-

ing the "üh-eh" note—a denunciation which made me feel duly contrite!

In flight this finch reminds one of *Loxia*. The freshly killed female has the supercilium a bright orange yellow, borders to the anterior feathers of the occiput, dull orange yellow and the forehead a dingy yellow.

Striking up north-west from Liddarwat to the Yem Her Pass the hillsides are devoid of trees, but the open slopes from 10,000 feet and over are carpeted with flowers of various kinds and hues, docks, thistle and weeds, etc. Among this luxurious and knee-deep herbage large parties of Tickell's Willow Warbler (*Phylloscopus affinis*) were to be seen feeding on the numerous small flies and aphides adhering to the plant heads.

From 11,000 to 13,500 feet. The Blue-fronted Redstart (*Ruticilla frontalis*) was not uncommon. This Redstart appeared partial to rocky moraines near streams. It does not shiver* the tail, but flirts it vertically once or twice like *Chimarrhornis leucocephalus*, though not so vigorously as the latter.

A greyish robinlike bird seen in the distance on a moraine was, I have little doubt, a Himalayan Ruby throat (*Calliope pectoralis*).

The presence of the Grey Wagtail (*Motacilla melanops*) at 12,000 feet and over surprised me. This graceful wagtail was ubiquitous and abundant in Kashmir this year. A habit of the species, noticed both in Scotland and the Himalayas, is feeding, at times, in woodland and dry places often some hundreds of yards from water.

Below the Yem Her Pass, on the Liddar side, the stream issuing from a small glacier runs over a flat stretch and has formed a marshy tarn. Off this at 13,500 feet I put up a small wisp of green sandpipers (*Totanus ocropus*) and a greenshank (*T. glottis*).

Numerous Marmots (*Arctomys caudatus*) had their burrows in the hillsides round this tarn and the shrill cries† and strange aspect of these big rodents were a source of vast excitement to my terrier.

Once over the Pass the track after a steep drop runs along bare but grassy hillsides and then descends through beautiful forest to the Sind Valley. In the forest I found the Spotted Nutcracker (*Nucifraga multipunctata*), common as indeed it was all along to Sonemurg. This bird, contrary to the impression it first gave me in the Hazara Hills, is not at all shy, and is often most inquisitive. The note is harsh and magpie-like and could be well imitated by two or three rapid twirls of a child's wooden toy ratchet. It usually affects forest, though I have seen a pair well in the open. It however has to come into fairly open parts to feed on the walnuts that grow along the Sind river and to which it is partial.

* The only species of this subfamily that I am acquainted with that vibrate the tail are *Ruticilla phaniceus* and *R. rufiventris*. It would be interesting to have a list of the members of the *Ruticillinae* which shiver or vibrate as opposed to flirt and wag the tail.

† It can hardly be correct to talk of the Marmots "whistle" as so many writers do. A whistling Mammal, apart from man, somehow does not sound congruous!



Sonemurg—A bit of Woodland.

At Sonemurg* (9,000 feet) the scenery, in this most delightful of summer camping resorts, was charming and impressive. Bird-life was abundant, and as usual young birds of the year were much in evidence. A feature of this bird-life was the chough (*Graculus eremita*), a handsome member of the *corvidæ* with its blue black plumage and brightly coloured bill and legs. Its caw is jackdaw-like, though squeaky, and various shrill squeaky notes are uttered that can be heard at a great distance. Often these notes produce a curious effect, especially when uttered in the air, for they deceive one into imagining that they proceed from some bird in a bush close by till one discovers that some black specks high in the blue are responsible for the sounds. When the breeze is strong—(in Sonemurg breezes often are strong)—the chough is fond of gambolling high in the air.

The Jungle Crow (*Corvus macrorhynchus*) also occurs in some numbers, but it was noticeable that, when occasionally it fed in flocks on the open "Murg" like rooks, the Chough, which does the like habitually, never associated with the crows.

Once I saw a flock of Jackdaws (*C. monedula*) on the "Murg," a high elevation for this species as it is low for the Chough in summer. But the Jackdaw becomes a great wanderer after the young are fledged in the

* For the benefit of those who do not know Kashmir, I may state that the word "Sonemurg" means "The golden Meadow." The name probably originated in the mind of some poetically inspired Kashmiri, who was impressed by the profusion of yellow *ranunculae* (species of butter-cups) and ragwort which covers the open downs or "Murgs" between the edge of the forest and the river in summer.

vale of Kashmir, where it breeds so abundantly, and flocks proceed to considerable elevations up the mountain valleys.

Though mountain torrents pour down from numerous glaciers round Sonemurg, it was surprising in what appeared such a suitable environment, not to find. The Western Spotted Forktail (*Henicurus maculatus*), possibly the bird had descended to lower elevations after breeding. The only representative of this group seen was The Little Forktail (*Microcichla scouleri*) and of it only a single pair were observed on one occasion.

An example of Hodgson's Shortwing (*Hodgsonius phenecuroides*) seen one day was another species new to me. The way this bird cocks its long tail at an acute angle to the body makes it look like some overgrown wren, but its habits, otherwise, unmistakably proclaim it a member of the *Crateropodidae*.

Jerdon's Accentor (*Tharralæus jerdoni*), a handsome little bird, was not uncommon. This and the preceding species are skulkers in thick undergrowth, though the former is the worst delinquent in this respect.

Red-flanked Bush-Robins (*Ianthia rufilata*) were numerous, especially young birds, as also at Liddarwat. A ready means of identifying the young, in places where this species is likely to occur, is by their habit of flirting or rather flicking the tail from the line of the back downwards, never elevating it above that line. This little bird has a ruficilline scolding note and is a true robin in habits.

It was homelike observing the Missel Thrush (*Turdus viscivorus*) in such numbers. This Thrush, as doubtless other observers have noted, becomes quite gregarious after breeding time, and during the autumn months. Flocks of 20 birds or more were not uncommon, both here and in the Liddar Valley. I have noted the same thing in Scotland and Ireland at this season. One flock in Sonemurg was in the habit of visiting a certain spot, on a mountain stream running through forest, for bathing purposes, and for several days in succession one could always count on finding the birds at their ablutions if the place was visited about 6 p.m.

One day while crossing a snow slope, below a glacier at about 11,000 feet, a pair of wagtails alighted on the snow beside me. I noted them down as "masked wagtails" (*Motacilla personata*), both being grey on the back, though they may have been *M. hodgsoni* in immature plumage, as this wagtail occurs on the "Murg" lower down. These two species in winter and immature plumage are terribly difficult to separate. In any case it was a curious spot to meet with a wagtail of either species.

Higher up I was surprised to find the Kashmir Martin (*Chelidon kashmiriensis*) hawking over the snow. The birds evidently were, or had been, breeding in the cliffs around. A cold forbidding spot for the purpose for such an usually confiding species.

In my rambles above tree limit at 11,000 feet and over, I had hoped to meet with, especially at the time of year, more than one species of Mountain Finch, but the only species observed here and in the Liddar,

was Stoliczka's Mountain Finch (*Fringillauda sordida*). The young of this species are much handsomer than the adults, the head being dark chestnut, the feathers of the mantle, scapulars, and wing coverts dark centred and bordered by rich fulvous. The irrides are apparently a nut brown or hazel not "carmine" as in the adult. This lark finch has a very sparrow-like chirp. It was common from 9,000 to 13,000 feet.

The White-Capped Redstart (*Chimarrhornis leucocephalus*), as before mentioned was noted as abundant, but more especially was this the case along the Upper Sind and its tributaries around Sonemurg. The "Fauna" hardly lays enough stress on this handsome redstart's aquatic habits. As Dresser puts it in his "Manual of Palaearctic Birds:" "The White-Capped Redstart in its general habits has much in common with the waterousel."



Glaciers, Sonemurg.

The Brown Dipper (*Cinclus asiaticus*) always afforded me intense pleasure in watching its aquatic performances. The seething turmoil of water this dipper will face, thrashing its way below the surface and appearing a foot or two higher up than where it dived is truly marvellous. Even this redoubtable diver is sometimes carried away by the stream. But it seems to be able to cling like a limpet to the first boulder it is brought in contact with, on to which it quickly scrambles out of harm's way, bobbing serenely, and seeming to relish these little escapades.

Returning to camp one evening a pair of Goldfinches (*Carduelis caniceps*) flew into a tree close by me and thence descended to drink at a stream. The only examples of this species seen in Sonemurg, though lower down the Valley they were commoner.

The loud "Treeka," "Treeka," note of the black and yellow Grosbeak

was often to be heard in the forests, though the birds seldom showed themselves. The note of this species is not always a safe guide as to the birds abundance or otherwise, as one bird can make enough noise for 20 of another species.

Compared with Hazara this Grosbeak was not common.

On the lower "Murgs" sparse crops of pulse and barley are cultivated. Here buntings and finches congregate in considerable numbers to feed, and here, I came across three examples of the common sparrow *Passer domesticus*—a bird it never gives me pleasure to meet with—but as the Sind valley lower down is cultivated to within eight miles of Sonemurg, the sparrow's presence in summer is perhaps not surprising even at this elevation.

I may here remark that two races of *Passer domesticus* are observable in Kashmir. One the common sedentary sparrow of Indian towns and villages, the other a migratory race that breeds up to 6,000 or 7,000 feet in the N.-W. Himalayas, the hills of N.-W. F. Province, Afghanistan and perhaps further west, and that winters, I imagine, in the Central Provinces, Dekhan, and may be, further south. This migratory race in its northward migration follows the ripening of the crops in the Punjab and N.-W. F. Province, and as Capt. C. H. T. Whitehead has shown in his paper on "The Birds of Kohat and Kurram," appears in association with *Passer hispaniolensis* and *Pastor roseus*, the enormous flocks comprising these three species doing devastating damage to the corn crops *en route*. It is this migratory race which is so strongly represented in Kashmir in Summer. It differs from the village sparrow in being more richly coloured, the back and scapulars being bay rather than chestnut, and it is, I think, a slightly larger bird. It generally breeds in holes in chenaars and willows and often at some distance from villages, though it avoids forests, being replaced therein by the chestnut headed sparrow (*Passer cinnamomeus*).

Before I left Sonemurg on 3rd September migration, though not strongly marked, had set in. The following species, evidently on their passage down from higher, colder and more northerly regions, were observed.

A blue throat (*Cyanecula*), species not determined as, owing to the thick cover in the crops, the bird would not give me a chance to shoot it.

The common Rose Finch (*Carpodacus erythrinus*), common.

The Red-headed Bunting (*Emberiza luteola*) a few.

The Tree Pipit (*Anthus trivialis*) abundant, and the only Pipit, as far as I could see, in the place. I should have expected to meet with *A. maculatus* rather than with this species, especially in such numbers.

The shooting season was now about to open, and the "call" of snipe, duck and chikor was insistent, but it was not without regret that I bid farewell to Sonemurg, its birds and scenery, to follow more exciting, if less interesting pursuits in the vale of Kashmir below. I hope to revisit these parts, next time in the breeding season.

A LIST OF INDIAN BUTTERFLIES.

BY

CAPT. W. H. EVANS, R.E.

During the last few years a good deal has been written on the butterflies of India including several works of great importance; unfortunately the views of the various authorities are at variance on many points and in order to arrive at a correct conclusion it is often necessary to search through numerous publications in different languages.

Nothing original is claimed for the list here produced; it is the result of many days spent at the British Museum, some thirteen years of assiduous collecting in nearly every part of India and a careful study of all that has been published during the last 20 years on the butterflies of India and neighbouring countries. A Government servant cannot of course devote as much time to a subject of this nature as the man of leisure or the professional naturalist is able to, but I think it only fair to claim that one who has watched insects in their natural state can often produce evidence regarding them that is out of reach of the man who only sees the same insects in a cabinet.

I have no doubt that this list is far from perfect and I hope that Indian collectors will point out any errors as well as communicate the results of their experience in the Society's Journal. A good collection at Bombay would be of great assistance to collectors; the Society requires specimens, with dates and localities, of practically every form from every part of India. Separately printed lists with the remarks and synonyms omitted can be obtained from the Honorary Secretary; the list ought to prove of assistance in labelling collections, making exchange lists, etc.

The more important sources of information on Indian butterflies are as follows:—

- (i) De Nicéville's "Butterflies of India, Burmah and Ceylon" published from 1884-1890, and completed to the end of the *Lycænidæ*. This was for some time the standard work and even now its wealth of detail renders it of the greatest use to

a student; since its publication, however, many new species have been discovered, certain changes of arrangement due to increased knowledge have been found necessary and the system of dividing species into local races has been matured.

- (ii) Moore's "*Lepidoptera Indica*" begun in 1890 and completed by Col. Swinhoe nearly to the end of the *Lycænidae*. It is a magnificent work, each insect being fully described and figured; its price unfortunately puts it beyond the reach of most collectors in India. The general arrangement is similar to that adopted by De Niceville, but in details there is a great difference; large comprehensive genera are split up into several new genera and in many cases numbers of new species are formed out of what had previously been regarded as a single variable species.
- (iii) Bingham's "*Butterflies*" (*Fauna of India*), the first two volumes to the middle of the *Lycænidae* issued in 1905 and 1907; the third and fourth volumes being completed by Mr. H. Druce. Drastic, perhaps too drastic, treatment is here meted out to many of Moore's genera and species; many hitherto supposed species are placed as local races or sunk as synonyms or mere varieties.
- (iv) Seitz "*Macrolepidoptera of the World*" by various German naturalists, begun in 1906; the palæarctic portion is completed, the Indo Malayan section has got as far as the beginning of the *Nymphalinae*, the *Papilionidae*, *Pieridae*, *Danainae* and *Satyrinae* being completed. This is an excellent and reasonably priced work of reference with a coloured figure of nearly every species; the descriptions, however, are very meagre. The numbers of actual species are considerably reduced but many new local races and varieties are introduced while in many cases names have been given to seasonal forms. The general arrangement differs somewhat from that adopted by English authors.
- (v) Elwes and Edwards "*Revision of the Oriental Hesperiidæ*," 1896, based on Watson's "*Key to the Indian genera of Hesperiidæ*" issued shortly before. This monograph gives

keys to aid in the identification of species and results of the study of the male organs.

(vi) Other important works are:—

(a) Rothschild and Jordan's "Revisions" of the Oriental *Papilios* and *Charaxes* (Nov. Zool., 1895 and 1896) based on the male organs; the principle of denoting a local race by a second name is here introduced.

(b) De Niceville's "New and little known Indo Malayan butterflies" appearing in this and the Asiatic Society's Journal from 1889 to 1901.

(c) Bethune Baker's "Revision of the *Amblypodia* group," 1903, based on the male organs.

(d) Chapman's "Review of the genus *Lycænopsis*" (= *Cyaniris*), 1908, based on the male organs.

(e) Verity's "*Rhopalocera Palæarctica*," a French work with good figures and plenty of detail; at present only the *Papilionidæ* and *Pieridæ* have been completed.

In this list an attempt has been made to correlate the works of Seitz, Bingham and Moore on the basis described below.

The general arrangement given by Bingham has been followed. Seitz differs in placing the *Papilionidæ* and *Pieridæ* first. Moore and Seitz have further subdivided some of the sub-families into groups, but as these groups are often more artificial than natural and run into each other, there seems to be no advantage to be gained by their employment. *Theclinae* is restricted to the *Thecliderda* group and *Deudoriginæ* introduced for the rest of Bingham's "*Theclinae*": the *Lycænid* sub-families are not very satisfactory. *Ismeninae* is here used for the *Ismene* group is the *Hesperiidæ*.

The most natural arrangement of genera is in the form of a genealogical tree and consequently a linear method can never be satisfactory. Bingham's order of genera has been followed with the exception of the *Satyrinae*, where Seitz's arrangement has been adopted; the position of *Cethosia* and a few other genera have been changed. *Aphnæus* has been placed next *Chrysophanus*, as in *Palæarctic* territory these two genera are closely allied. The *Deudoryx* and *Camena* groups have been brought together.

As regards the genera themselves Bingham and Seitz agree fairly well and where they differ, Seitz, who reviews the butterflies of the world, has usually been followed. Many of Moore's genera have been used as sub-genera; genera are thus rendered more comprehensive and natural groups within them kept separate.

The word "species" has been a source of much contention and Bingham substituted the word "form" for it, an indefinite term meaning anything from a species to a slight variety. The matter does not seem to present any great difficulty as long as it realised that a local race may develop into a species and eventually into a genus, that no hard and fast rule is laid down and that this development may be encountered at any stage. For ordinary purposes a species may be defined as a group of individual forms that resemble one another more or less and are capable of freely interbreeding with one another but normally refuse to breed with any other species.

A species spread over a wide area may develop into a number of more or less well defined local races and more especially so if geographical obstacles intervene. Migratory species like the *Catopsilia* and *Polyommatus boeticus* are always intermixing, thus preventing the formation of local races. Weak flying hill species separated by intervening plains are almost certain to develop into races and perhaps eventually into new species; thus the Nilgiri *Colias* is a race of the Himalayan *Colias lativitta* which itself is a race of the European *Colias hyale*.

A local race may eventually develop into a species, but when a race actually becomes a species it is impossible to say. Many entomologists affirm that if the male organs of two forms are alike they are conspecific and *vice versa*, if the male organs differ they belong to two species; this does not seem to follow necessarily and the only real test would be to put several individuals of one race with several individuals of another race and watch if interbreeding occurred. In many instances grading between races is apparent where the boundaries of their respective areas meet, but where some geographical obstacle intervenes this is impossible.

It is assumed here that where two forms inhabiting separate areas resemble each other fairly closely, though differing in certain

respects, they are races of the same species : also no two local races can fly together. This latter statement was not accepted by Col. Bingham, who, for instance, placed *Ypthima ceylonica* as a race of *hübneri*, in spite of the fact that they fly together and that, as had been pointed out by Elwes, their male organs differ. Dr. Chapman also considers that *Cyaniris huegeli* and *cœlestina* are conspecific, though flying together, as their male organs are alike : of course, this may be a case of dimorphism and the question can only be settled by breeding experiments.

There is at the present time a tendency to multiply local races, and the difficulty is to know where to stop : often in mountainous districts, forms from neighbouring valleys differ and a change of elevation may produce a marked effect. Where sufficient material has been available in the B. M., I have carefully investigated the merits of every local race described up to the time of writing : where there was no visible difference to be detected the race has been sunk as a synonym.

A species or race is subject to variation in a number of ways as follows :—

- (a) Seasonal forms due to climatic changes during the year. In some species the differences are very small, in others as *Erebia annada* there is a sharply marked change, while in others again as *Terias hecabe*, though the extreme forms are very different, yet intermediate forms connect them by an almost insensible gradation. To name seasonal forms, as done by Seitz, seems a mistake : it would be better to designate them as d. s. f. and w. s. f. (dry or wet season form) or f. vern. and f. aest. (spring or summer form).
- (b) Dimorphs occur in a few species being oftener confined to the female sex. True dimorphs are frequently occurring forms unconnected to the normal forms by intermediates. They are best designated by a Latin name with the prefix “d” and also “♂” or “♀” if confined to a particular sex.
- (c) Varieties are forms frequently occurring with the normal form, differing from it in certain particulars, but connected by intermediates. What varieties should be named is a standing *casus belli* among entomologists. With highly

variable species as occur in the genera *Kallima* and *Melanitis* it would be ridiculous to name every variety and the same might be said of *Terias hecabe* and *Charaxes hierax*. To ignore all varieties would be wrong, but where the limit is to be placed must always remain a matter of opinion. In this list well marked varieties of species that are not inordinately variable are included and designated by the prefix "v," the sexual sign being added where necessary.

- (d) Hybrids are rare in nature, though of not infrequent occurrence in the genus *Colotis*: they are not, as a rule, worth naming, and the only one given here is *Colias chrysodona*, generally regarded as a hybrid between *C. erate* and *fieldii*.
- (e) Aberrations are due to some abnormal condition and are of infrequent occurrence; they differ more or less from the normal form and are not connected with it by intermediates. They are not worth naming though in many cases this has been done.

In the past many a new species has been described from a single specimen with unfortunate results: it would be better, as a rule, to consider any possible new form as an aberration until more specimens are obtained: it should then be considered whether it is a variety or seasonal form of an already known form flying in the same district: next the question of it being a local race of a species in some other area should be investigated; only when these steps have been completed should the possibility of it being a new species be considered.

A full synonymy has not been given except for the *Hesperiidae*; changes of nomenclature, etc., are pointed out in the notes. Some new forms about to be described by Maj. Tytler have been included.

The following new sub-genera, species, races, etc., have been described:—

Satyrus hübnerei moorei. *Ypthima (shania)*.

Mycalesis perseoides khasia. *M. visala orcha*. *M. lepcha watsoni*.

Apatura ambica chitralensis. *Sephisa chandra* ♀ d. *chandrena* and ♀ v. *albina*.

Euthalia garuda diversa. *Neptis columella kankana*. *Neptis melba*. *Argynnis hyperbius hybrida*. *A. jainadeva pallida*. *A. aglaia ashretha*. *Melitæa sindura balba*. *M. trivia mixta*. *Papilio polytes* ♀ d. *stichioides*. *Papilio*

(*Mimbyasa*). *Aporia nabellica hesba* *Pieris canidia canis*. *Colotis amatus*,
 ♀ *d. albina*. *Lycæna orbitulus walli*. *Lycæna (Tiora & Bryna)*. *Lycæna*
sebrus shandura. *L. devanica gracilis*. *Lycænesthes emolus topa*.
Ilerda androcles viridis. *Arhopala ganesa watsoni*. *Parnara (Milena)*.

LIST OF ABBREVIATIONS USED FOR LOCALITIES.

As. = Assam.

An. = Andaman.

Bhut. = Bhutan.

B. = Burma.

Bal. = Baluchistan.

C. = Ceylon.

Chit. = Chitral.

Centr. = Central India.

C. P. = Central Provinces.

Him. = Himalayas.

I. = India generally.

Kash. = Kashmir.

Kan. = Kanara.

Kum. = Kumaon.

Lad. = Ladak.

L. B. = Lower Burma.

Muss. = Mussoorie.

N. I. = North India.

Nil. = Nilgiris.

Ni. = Nicobars.

Sik. = Sikkim.

S. = South India.

S. B. = South Burma.

Ten. = Tenasserim.

S. Ten. = South Tenasserim.

W. H. or W. Him. = Western Himalayas.

E. H. = Eastern Himalayas.

Up. B. = Upper Burma.

Up. As. = Upper Assam.

Trav. = Travancore.

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		DANAINÆ.				
Hestia ..	(Hestia) ..	jasonia, Wd.	....	C.	.....	Fruhstorfer's arrangement has been adopted for the Danaina, a few more of Moore's subgenera having been used in Euplea.
		malabarica, M.		S.		
		kanarensis, M.		Kan.	.....
		agarmarschana, Fd.		Ten.	.....
		arrakana, Fruh.		Arrakana, Up. B.		Arracana is a good race intermediate between agarmarschana and cadelli; margherita I have not seen, but Upper Burma specimens are arracana.
		hadeni, W.M. & De N.		Bassein.	.....
		margherita, Fruh.		Up. As.		DeNiseville gives Ideopsis deopsis (Gamana) Daos, Bdl., from India stating that it has been bred on the Tenasserim coast; no author since has included it amongst the Indian butterflies.
Danais ..		cadelli, W.M. & De N.		An.		
	(Nectaria) ..	hypermintheata, But. nestra.		S. Ten.		
	(Radena) ..	similis ..		vulgaris, But.	B.	
		expro m p t a, But.		C.		
		nicobarica, W.M. & De N.		Ni.		
(Parantica),	aglea, Cr.	....		S. C.		
		melanoides, M.		Kash.—B.	Fruh as grammica, But., usually put as=aglea. Fruh separates Ten. race as phor- mion.	
		melanoleuca, M.		An.		
	eryx ..	agleoides, Fd.		B. Ni.	Fruh "eryx=agle- oides," =crocea, But.	
(Ravade- bra),	aspasia, Fab.	....		S.B.		
(Chittira) ..	fumata, But.	....		C.		
	nilgirien- sis, M.	....		S.		
	melaneus, Cr.	....		Sik.—B.	=plateniston, Fruh ("melaneus, Chi- na").	
	tytia, Gray.	....		Kash.—B.	Fruh "W. Him. race=sita koll."	
(Tirumala),	gautama, M.	....		B.		
		gautamoides, Doh.		Ni.		
	limniace, Cr.	....		I. B. C. Ni.	Fruh separates C. race as mutina.	
	melissa ..	septentrionis, But.		N. I. B.		
		dravidarum, Fruh.		S.		
		musikanos, Fruh.		C.		
(Salatura) ..	plexippus, L.	....		I. B. C. Ni.	nepalensis, M. a cas ab.	
	melanip- pus.	indicus, Fruh		Beng.—B.	hegesippus, Cr., Malay Peninsula.	
		nesippus, Fd.		Ni.		
	chrysippus, L.	....		I. B. C. An.		
		(d. dorippus, Cr.)		Ni.		
		(v. alcippoides, Cr.)		....	alcippus, Cr., Afri- ca.	

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		DANAINÆ,—contd.				
—contd.						
Euploea	.. (Crastia)	modesta, But.	....	B.	...	
		camaralzaman, But.	....	S. Ten.		
		bremeri, Fd.	Ten.		? Indian race = oliracea, M.	
		crameri .. frauenfeldii, Fd.	Ni.		= esperi, Fd. bise-riata, M.	Regarding frauenfeldii, this name was given to an insect said to have come from Ceylon; esperi and biseriata were described as two exactly similar insects from the Nicobars, the former having and the latter lacking the Male brand. Fruhstorfer following De Nicville (J. As. B. 1901) places them all under frauenfeldii. An exactly similar case in every respect is presented by scherzeri, camorta and simulatrix and I have here united them all under scherzeri.
		climena .. scherzeri, Fd.	Ni.		= camorta, M; simulatrix, W.M. & De N.	
		core, Cr. ..	....	I. B. An.		
		vermiculata, But.	Him. foot-hills.		nicevillei, M. a cas ab.	
		asela, M. ..	C.			
		godarti, luc.	....	As.—B.	defigurata, Fruh. an ab.	
		(d. layardi, Druce).	....		= subdita, M.	
		andamanensis, Atk..	....	An.		
{Penoa}	.. alcathoe ..	double dayi, Fd.	Sik-Up. B.		alcathoe God. Amb-oia.	
		sesatia, Fruh.	S. B.			
		deione, Wd.	....	Sik.-B.	arida Fruh, Ruby Mines, a d. sf.	
		limborgii, M.	Up. Ten.			
		menetriesi, Fd.	S. Ten.			
{Stictoploea}	coreta, God.	....	S.		= coreoides, M.	
		montana, Fd.	C.			
		harrisi, Fd.	....	As.—B.	.....	harrisi is a very variable form and hopei is not a very satisfactory race; however Sikkim specimens always have the forewing discal spots well developed, while in the Eastern form these spots are often absent.
		hopei, Fd. ..	Sik.—As.			
{Trepsech-	mulciber, rois).	....	Simla-B.Ni.			
	Cr.	kalinga, Doh.	Jaypur.			
{Calliploea}	mazares ..	ledereri, Fd.	Ten.			
{Euploea}	.. corus, Fd..	....	C.			
		phœbus, But.	Ni.			
		vitrina, Fruh.	S.B.			
{Isamia}	.. midamus ..	splendens, But.	Ē. Kum.-N. Ten.			
		margarita, But.	Ten.		= adamsoni M a v, brahma, M.	
		roepstorffii, M.	....	An.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		DANAINÆ.—contd.				
Euploea —contd.	(Salpinx) ..	leucostictos novaræ, Fd.		B. Ni.	= leucogonys, But.	klugii is an extremely variable form and there are certainly many more unnamed than named varieties of this species. Leucostictos seems a distinct species, the hindwing is very pale presenting a great contrast to the forewing; also all the spots are conspicuously blue tinted.
		klugii, M. . . .		Sik.-B.		
		crassa, But. . .		S.B.		
		kollari, Fd. . .		Sik.-S.		
		sinhala, M. . .		C.		
	(Danisepe).	diocletianus, Fab.		As.-B.		
		ramsayi, M. . .		Sik.		
NYMPHALIDÆ.		SATYRINÆ.				
Pararge ..	(Lasion-mata).	schakra, Koll.		Chit.-Sik.	Fruhstorfer's arrangement of the Satyrinæ has been adopted; it has the advantage of bringing together the palæarctic genera and the sequence seems fairly natural. Seitz has been followed for the genus Satyrus.
		menava, M. . . .		Bil.-Kash.	= maeroides, Fd. a cas var.	
		maerula, Fd.		Chit.-Kum.		
	(Pararge).	eversmanni M.		cashmirensis, Chit.-Kash.		
	(Chonala) ..	masoni, El.		Sik.-Bhut.	usually in lethe, but better here.	
Rhaphicera	....	satricus, Db.		Sik.-As.	
		morei, But.		Simla-Sik.		
Melanargia.	....	halimede, Mén.		E Up. B.	
Orinoma.	....	damaris, Gray.		Kangra.-B.	
Satyrus ..	(Paraneis).	pumilus, Fd.		W.Him.		
		bicolor, Seitz		Sik.(Chumbi).	pumilus and bicolor are ochreous above, the latter with a very broad dark outer margin; palæarcticus is a dark brown insect with a prominent pale discal band as in Aulocera.
		palæarcticus, Std.		Sik.		
	(Aulocera).	brahminus, Blanch.		Chit.-Sik.	= scylla. But., We-rang, Lang.	
		sibyllina .		brahminoides, M. bi.)		
		swaha, Koll.		Chit.-Sik.		
		padma, Koll.		Kash.-Sik.	.....
						padma flies with loha in Sikkim and differs in the males constantly lacking the 2 white spots internal to the preapical ocellus on the forewing above.

padma flies with *loha* in Sikkim and differs in the males constantly lacking the 2 white spots internal to the preapical ocellus on the forewing above.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		SATYRINÆ.—contd.				
—contd.						
Satyrus (Aulocera)	loha, Doh.	....	Kum.-Al.			Chumbica is a small race of loha, which does not have the band on the hindwing above continued to the dorsum, also this band on the underside in the females is narrow and sharply defined.
—contd.	—contd.		chumbica, M. Sik, (Chumbi).	....	
	saraswati, Koll.	....	Chit.-Sik.			
(Karanasa).	hubneri, Fd.	....	Kash.-Lad.		caesia, modesta, M.	hubneri is a very variable form; Chitral specimens, called leechi by Moore, are larger with deeper bands and the ocelli on the forewing above have prominent white centres. Leechi. Groom from Samarkand was described first: it is a much smaller and paler insect. I propose to call the Chitral race <i>moorei</i> as leechi must be abandoned.
						I have omitted <i>semele diffusa</i> , But., of which the only known specimen, now in the B. M., is marked "locality doubtful."
			moorei, Ev...	Chit.	= leechi, M. (nec. Groom).	
	digna, Mar.	....	Chit.-Kash.			
	actæa	.. pimpla, Fd...	Bal-Lad.			
Nytha	.. paristis, Koll.	....	Bal-Chit =		macrophthalma, Evers.	
(Philareta).	heydenreichi, Mar.		Kum.			
	persephone, Hüb.	....	Bal-Chit.		hanifa, Hard, spring form ?	
(Eumenis).	mniszzechii, Hüb.	....	Bal-Chit.		enervata, Std.	
	baldiva, M.	.. Spiti, Kunawur.				
	lehana, M.	.. Chit-Lad.				
	thelephassa, Hüb.	....	Bal.			
Epinephele. (Maniola).	davendra, M.	....	Chit-Samarkand.			E. davendra and latistigma have two lower discal ocelli on the hindwing below, while brevistigma has only one; latistigma has the male brand much stouter than in davendra, while the discal line below is inconspicuous, tenuistigma, Kojak, male, is an ab. of latistigma resembling davendra.
			brevistigma, Balt-Lad.			
			M.			
			latistigma, M.	Bal.	=tenuistigma, M.	
	narica, Hüb.	....	Bal.			
	cheena, M.	....	Chit-Nep.			
	lycaon	.. interposita Ersch.	Bal.			pulchella and pulchra are separate species flying together; pulchella is ochreous, female as male, and often bearing a lower ocellus on the forewing above; pulchra male is dark brown, female ochreous with base much darker, the dark area being defined by a dark angled discal line.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ—cont.		SATYRINÆ—contd.				
Epinephele	(Chortobius)	pulchella, Fd.	....	Chit-Lad.		
—contd.		pulchra, Fd.	....	Chit-kum.	= neoza, Lang.	
		cenonympha, Fd.	....	Kash.	= maiza, goolmurga, Lang.	
Cenonympha.	(Lyela)	... myops	.. macmahoni, Sw.	Bal.	.....	C. macmahoni resembles a small Erebia and is unmarked except for a single blind ocellus, ringed ocellus on the forewing: myops, Std. from Ala has some spots on the hindwing below.
Erebia	.. (Paralasa)	.. mani, DeN.	....	Chit-Lad.		
		kalinda, M.	....	Kash-Kum.		
		shallada, Lang.	....	Chit-Muss.		
	Callerebia	daksha, M.	....	Kash.		
		nirmala, M.	....	Kash-Kum.	= intermedia, cashapa, M.	Seitz gives "Erebia saxicola Ober, N. Kashmir 6,000" while nirmala is placed in callerebia: his brief description and figures of saxicola agree exactly with a common Chitral insect found at 6000' and it is undoubtedly a race of nirmala, differing from it in being more uniform below and only bearing on the hindwing a single very small ocellus, rarely surmounted by minute white spots. An aberration of this insect was described and figured by De Niceville under nirmala in J.B.N.H.S. XIV, 236.
		saxicola, Ober.	Chit.			
		annada, M.	....	Kash-Bhut.	W. S. f. = hybrida, But.	
		orixa, M.	..	As-up B.		
		scanda, Koll.	....	Kash-Kum.		
	(Dallacha)	hyagriva, M.	....	Kash-Kum.		
	(Hemadara)	narasingha, M.	....	B		
Ypthima	.. (Shania)	.. megalia, DeN.	....	N. Shan St.	.....	A new sub-genus for megalia, DeN, seems necessary and I propose the name <i>Shania</i> , iarba is doubtfully placed in the sub-genus Ypthima.
	(Nadira)	.. bolancica, Mar.	....	Bal.		
	(Kolasa)	.. chenui, Guér.	....	S.		
		ypthimoides, M.	....	Palni, Travhills.		
	(Ypthima)	iarba, DeN.	....	Manipur.	.....
		hübneri, Kir.	....	I. B.		As ceylonica and hübneri fly together they are best regarded as separate species.
		kashmira, M.		Kash-Kulu		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.						
—contd.		SATYRINÆ.—contd.				
Ypthima (Ypthima)	ceylonica	Beng-S.C.		I believe that the species <i>affectata</i> , etc., placed near <i>baldus</i> and <i>methora</i> will eventually be found to be races of one or the other of these two forms in spite of the differences in the male organs, especially in view of the fact that Elwes found the male organs of <i>hubneri</i> , <i>ceylonica</i> , <i>kashmira</i> , <i>joecularia</i> and a <i>hubneri</i> from Sik all different. Undue importance is often given to minor differences in these organs.
—contd.	—contd.	Hew.				
(Pandima)..	asterope	..	mahratta, M. N. & Centr.	Asterepe.	Klug.	
			I. B.	Africa.		
	inica, Hew.	....	N.&Centr.I.		
	lycus, DeN.	....	Khasi.		
	lycoides, Wat.		Up B.	.....	overlooked by Moore and Bingham.
	watsoni, M.	....	B.		
	nareda.	....	Kash-Kum.		
	Koll.					
	newara, M.	....	Sik-As.		
	sarcoposa,		B.			
	Fruh.					
(Thymipa)..	philomela,	....	S.	—tabella, Mar.	
	Johan.					
	indecora, M.		Kash-Kum.			
	baldus,	....	I. B.		
	Fab.					
	affectata,	....	As.		
	El Ed.					
	similis, El	....	S. B.		
	Ed.					
	sobrina, El.	....	S. B.		
	Ed.					
	methora,	....	Sik-B.		
	Hew.					
	persimilis, El		Manipur.			
	Ed.					
	doher tyi,	....	S. B.		
	M.					
	savara, Gr	....	B. hills.		
	S.					
	sakra, M. ..	....	Sik.		
	nikaea, M. ..		Kulu-Kum.	.....	Fruh gives <i>matinia</i> as a pale race from N.W. India.
	austeni, M. ..		As-B.			
	avanta, M..	....	Kash-B.		
	cerealis, Wat.		B (Myingyan).			
	striata,		Nilgiris.			
	Hamp.					
	singala, Fd..		Centr. I-C.			
Zipetis ..	....				
	scylax,	....	Sik-up B.		
	Hew.					
	saitis, Hew.	....	S.		
Erites ..	....				
	medura ..		falcipennis, Kash-up B.			
			W.M.&DeN.			
	rotundata,	....	S. B.		
	DeN.					
	angularis,	....	B.		
	M.					
	argentina..	ines, Fruh. ..	Ten.	argentina.	But	
				Borneo.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		SATYRINÆ.—contd.				
		—contd.				
Ragadia	....	crisilda, Hew.	....	Cach-Ten.	.....	Fruh places critolaus and cri- as races of crisilda.
		critolaus, DeN.	....	Ten.		
		crito, DeN.	....	Bhut-As.		
Lethe	.. (Lethe)	europa, Fab.	....	I. B.	= niladana and ra- galva, Fruh.	Fruh. confines europa to the Ph- lippine, etc., giving niladana a the North Indian and ragalva as the South Indian race.
		nudgara, Fruh.	....	An.		
		drypetis, tamuna, Hew.	....	Ni. S. Oriss.		
		todara, M.	..	C.		
		dyrta, Fd.	....	Kash-B.	= rohria, Fab.	Aurivillius in 1897 stated the what had usually been called dyrta, Fd., should be rohria Fab., and the insect known as rohria he renamed confusa Bingham followed him but Seitz and Fruhstorfer have not and have put confusa as a synonym of rohria. As Bingham only appears to have followed Aurivillius. I have used dyrta but I think confusa ought to be used for what most authors call rohria
		nilgiriensis, Guér.	....	Centr. I-C.	Fruh. separates the Ceylon form as yoga.	
		daretis, Hew.	....	C.		
		insana, Koll	....	Chumba- Kum.		
		dinarbas, Hew.	....	Kum-As.		
		brisan da, DeN.	....	Bhut-As.	This seems a good species.	
		confusa, Aurivill.	....	Simla-Sik.	= rohria, Auct, nec. Fab.	
		gamhara, Fruh.	....	As-Up B.		
(Dionana) ..	margaritae, EL.	....	....	Bhut.		
(Nemetis) ..	naga, Doh. miner va, Fab.	....	....	Up As. B.		
		tritogonia, Fruh.	....	Ten.	I have not seen this.	
(Debis)	sinorix, Hew.	....	....	Sik-B.		
	mekara, M.	....	....	Sik-B.	Fruh. separates the As-B. race as zuchara.	
	chandica, M.	....	....	Sik-B.	Fruh. separates the As-B. race as fla- none.	
	distans, But.	....	....	Sik-B.		
	kansa, M.	....	....	Kum-Sik.		
		zeugitana, Fruh.	....	As.B.	Fruh. separates the Ten. race as vaga, Fruh.	
	serbonis, Hew.	....	....	Sik-As.		
	satyavati, DeN.	....	....	Sibsagar.		
	vindhya, Fd.	....	....	Sik-B.	Fruh. separates the Ten. race as lad- esta.	
	dynsate, Hew.	....	....	C.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		SATYRINÆ—contd.				
—contd.						
Lethæ —contd.	(Blanaida) contd.	pulaha. M.	....	Chumba- Kum.		Seitz uses Neope for a genus DeN. stated that this name was preoccupied by birds and pro- posed Blanaida instead.
		pulahoides, M		Sik.-B.		
		muirheadi. bhima, Mar..		B.	muirheadi, Fd., China.	
		yama, M...	....	Kulu-Kum.		
		yamoides, M.		Sik.-B.		
Neorina ..	(Neorina) ..	hilda, Wd.	....	Sik.-As.		
	(Hermia- nax).	chrisna ..	archaica, Fruh.	Ten.	chrisna, Wd., Java.	
		patria ..	westwoodi, M.	As.-Ten.	patria, Leech, China	
Coelites ..	....	nothis ..	adamsoni, M.	Bharno.	nothis, Bdv., Siam	
		epiminthia.	binghami, M.	Ten.		
Mycalesis..	(Virapa) ..	anaxias.	....	Sik.-B.-S.	Fruh. separates the Burma form as seimate.	
		radza, M. ..		An.		
		manii, Doh..		Ni.		
		adamsoni.	....	Up.B.		
		Wat.				
		anaxoides ,	....	S. B.		
		Mar.				
(Garoris) ..	francisca..	sanatana. M..		Kulu-B.	Fruh. separates the Burmese form as gomia.	
(Sadarga) ..	gotama ..	charaka, M..		As.-B.		
Suralaya) .	orseis, Hew.	....		Naga H.- Ten.	Fruh. separates the Indian form as nauticus, But.	
(Calysisme)	perseus,	....		I. B. C.	.....
	Fab.					
	mineus. L.	....		NI.-B.Ni.	=nicobarica, M.	
		polydecta. Cr.		Centr I- S. C.		
	perseoides.	....		B.	=intermedia, M.	
	M.					
		khasia, Ev. ..		khasi Hills.		I have placed subdita, M. as a race of perseoides; they both have a very similar male brand on the forewing below. Bingham described a similar form from Mysore which Fruhstorfer has named igilia; I have the same insect exactly from Pachmarhi. I also have several specimens from the Khasi Hills (w. & d. s. f.) which belong to this species: they are larger and brighter than the other forms of perseoides and are very close to visala but the male brand is short and pale brown as in perseoides, not long and silvery as in visala: I propose to call this form khasia.
		igilia, Fruh.		Pachmarhi- Mysore.		
		subdita. M...		S. C.		
	visala, M....	....		Kum.-B. Centre I. & Madras.	Fruh. separates the Ten. form as neo- visala.	

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		SATYRINÆ.— <i>contd.</i>				
<i>Mycalesis</i> (<i>Calysimo</i>) — <i>contd.</i>	<i>visala</i> , — <i>contd.</i>	<i>M. orcha</i> . Ev. ..		Palni, Ani- maais Hills.		In the B. M. are several speci- mens of <i>visala</i> from the Ani- maais and I have others from the Pannis which differ const- antly from the Northern <i>visala</i> these specimens belong to an intermediate form, some were caught in September and others in February. The male brand is as in <i>visala</i> , the wings are not so pointed, under the ocelli are smaller and never quite obso etc; in the drier forms the lower ocellus on the fore- wing below shows up as a very prominent white spot: the white discal line is much dif- fused outwards. I propose to call this form <i>orcha</i> .
			andama.	An.		
		<i>evansii</i> . Tyt.	....	Manipur.	This new species will shortly be described by Maj. Tytler.	
		<i>rama</i> . M. ..	....	C.		
(Telinga) ..	<i>oculus</i> . Mar.	....		Palni Trav. Hills.		
	<i>adolphoi</i> . Guér.	....		Nilgiri, Mangalore.		
(Pachama) ..	<i>mestra</i> . Hew.	....		Bhut. As.	Fruh. separates the Bhutan form as vetus.	
	<i>suavolens</i> . WM and DeN.	....		Sik.-Up B.		
(Samanta) ..	<i>nicotia</i> . Hew.	....		Muss. B.		
		<i>nudgara</i> . Fruh.	....	Ten.		
	<i>misenus</i> . DeN.	....		Sik.-As.		
	<i>heri</i> . M. ..	....		Kum.-Bhut.		
	<i>malsara</i> . M.	....		Sik..B.	placed as a race of <i>Malsara</i> and <i>lepcha</i> are usually <i>mamerta</i> , Cr. (=mineus) by Fruh.	considered as races of one species, they, however, occur together in the Naga Hills, Manipur and Upper Burma. Watson (in J.B.N.H.S.X.) said "malsara and lepcha seem to meet and mix in Chindwin." Major Tytler has sent me a good series of both forms from Manipur and I am convinced that they are separate species. The Eastern form I propose to call <i>watsoni</i> , it differs from the Western form in a ways having 1 upper and 2 (not 1) lower ocelli on the forewing above.
	<i>lepcha</i> . M. ..	....		Ku u- Kum.		
		<i>bethami</i> , M. ..		Pachmarhi		
		<i>davisonii</i> , M.		Palni H.		
		<i>watsoni</i> , Ev. ..		As.-Up. B.		
(Kabanda) ..	<i>malsarida</i> , But	....		Cash.-As.		
(Nissanga) ..	<i>patnia</i> . M.	....		C.		
		<i>junonia</i> , But.		S.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		SATYRINÆ—contd.				
—contd.						
Mycalesis.	(Cutapa) ..	mnasicles..	perna, Fruh.	S. B.		
—contd.	(Myrtilus).	mystes,	....	Up. B.		
		DeN.				
	(Loesa) ..	oroatis ..	surkha, Mar.	Ten.		
	(Orsotri-medea, Fab.	....	NI, B.	.....		Orsotricena is usually put as separate genus, but it would seem more convenient to put it as a sub-genus of Mycale as DeNiceville did.
			mandata, M.	S. C.		
Melanitis..	....	leda ..	ismene, Cr...	I. B. C.		
		phedima ..	bela, M. ..	Kash.-B.	Fruh. separates the West Himalayan form as galanga and the Tenasserim form as galapati.	
			bethami, Pachmarhi.			
			DeN.			
			varaha, M. ..	S.		
			tambra, M...	C.		
		zitenius.	....	E. Kum.-B.	.....	Gokala is undoubtedly a race zitenius; of kalinga there is only one specimen in the M., which is intermediate between gokala and zitenius.
		Herbst.				
			auletes.	Ten.		
			Fruh.			
			gokala, M. ..	S.		
			kalinga M. ..	Godaveri.		
Cyllogenes.	....	suradeva.	....	Sik.		
		M.				
		janetæ,	....	Bhut. As.		
		DeN.				
Parantirrhoea.	....	marshalli,	....	Trav.		
		W. M.				
Anadebis ..	(Anadebis).	himachala,	....	Sik.-Up. B.		
		M.				
	(Zethera) ..	diadernoides M.	....	Ten.		
Elymnias ..	(Elymnias).	hypermnestru.	undularis, Drury.	Muss.-Up. B.		
			tinctoria, M.	B.		
			caudata, But.	S.	.....	Caudata is usually placed as separate species, but it seems to have no more right to be considered so than has fraterna.
			fraterna M.	C.		
		cottonis, Hew.	....	An.		
			obnubila, Mar.	S. B.		
		panthera ..	mimus, W.M. & DeN.	Ni		
		dara ..	dædalion, DeN.	B.	dara, Dist. N. Borneo.	
(Melynia).		singhala, M.	....	C.		
		pealii, W.M.	....	As.		
		nesaea ..	timandra, Wau.	Sik.-As.		
			cortona, Fruh.	B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		SATYRINÆ—contd.				
—contd.						
Mymnas.	(Melynias)	malelas,	....	Sik.-B.		
—contd.	—contd.	Hew.		Kum.		
		nilamba,		Ten.		
		Fruh.				
		saueri, Dist.				
		patna, Wd..	....	Kum.-As.		
		patnoides, M.		B.		
(Mimadelias).	vasudeva,	....	Sik.-As.	=thycana & deva,		
	M.			M.		
		burmensis, M.	B.			
(Bruasa) ..	penanga ..	chelensis,	As.-B.	penanga, Wd., Ma-		
		DeN.		lay Penin.		
(Agrusia) ..	esaca, Wd..	....	Mergui.	= andersonii, M.		
MORPHINÆ.						
Jerome ..	....	arcesilaus,	....	Sik.-B.		
		Fab.				
		eumeus ..	incerta, Stdg.	S. Shan		
				St.		
			assama, Wd..	As.		
Melanocy-	....	faunula ..	faunuloides,	Up. B.		
ma.			DeN.			
anthotæ-	....	busiris, Wd.	....	Ten.		
nia.						
hauman-	....	lucepor,	....	Ten.		
tis.		Wd.				
		diores, Wd.	....	Sik.-B.		
Thauria ..	....	aliris ..	intermedia,	B.	pseudaliris, But	
			Croweay.		Maya Penin.	
Tictopthal-	....	camadeva,	....	Sik.		
ma.		Wd.				
			nicevillei,	As.		
			R b.			
			camadevoi-	Up. B.		
			des, DeN.			
		nourmahal,	....	Sik. Naga		
		Wd.		Hills.		
		nurinissa,	....	Bhut.		
		DeN.				
		howqua ..	sparta, DeN.	Manipur.		
		louisia,	....	S. B.		
		WM.				
Zeuxidia ..	....	amethystus	masoni, M.	S. B.	.....	Zeuxidia doubledayi has not
						been included by Moore and
						Bingham, but DeN. recorded
						it in J.B.N.H.S. XII, 329, from
						Tenasserim.
		doubledayi,	....	Ten.		
		Wd.				
Amathusia.	(Amathu-	phidippus,	....	B. Travancore.		
	sia.)	Joh.		An.		
			andamanen-			
			sis, Fruh.			
	(Amathuxi-	amythaon,	....	Sik.-B.		
	dia.)	Db.				
Emona ..	....	lena, Atk.	....	B.		
		amathusia,	....	Sik.-As.		
		Hew.				
Discophora	....	celinde ..	continentalis,	Sik.-B.		
			Std.			
			andamanen-	An.		
			sis, Std.			
		deo, DeN..	....	Up. B.		
		lepida, M..	....	S. C.		
		tullia ..	indica, Std.	Sik.-B.		
				Kan.		

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
NYMPHALIDÆ.		MORPHINÆ.— <i>contd.</i>				
— <i>contd.</i>						
Enispe ..	....	euthymius, Db.	....	Sik.-B.	tessellata, M., a seasonal form.	
		cyenus, Wd.	....	Sik.-B.		
NYMPHALINÆ.						
Charaxes .. (Haridra) ..	psaphon, Wd.		....	C.	.....	Rothschild and Jordan's "Revision" of this group in Novitates Zoologicae has been followed.
		imna, But.		Beng.-S.		
	polyxena ..	hierax, Fd.		Sik.-B.	.....	The numerous varieties of hierax do not seem to be worth retaining; hierax can be used for the banded forms and hipponax for the banded forms. The form naganum described by Maj. Tytler seems constant and confined to these hills only; as no other form occurs with it, I think it is best treated as a separate race.
		(v. hipponax, Fd.) naganum, Tytler. hemana, But.		Naga H. Muss.-Kum.		
		aristogiton, Fd.	....	Sik.-B.	= desa and adamsoni, M.	
		marinax, Wd.	....	E. Kum.-B.		
		kahruba, M.	....	Kum.-B.		
	durnfordi,	nicholi, Gr.S.		S. B.		
	distanti, Hon.		....	Ten.		
	fabius, Fab.		....	I. S. C.	raidhaka, Rh ⁴ Philippe, is a cas ab.	
		sulphureus, Roth.		Naga H., -B.		
Eulepis .. (Eulepis) ..	athamas, Drury.		....	N.I.-B.	Rüber rejects Eulepis for Eriboea.	
	agrarius, Sw.			S. C.		
	arja, Fd. ..		....	Sik.-B.		
	schreiberi ..	assamensis, Roth.		As.-B.	.....	Bingham unites these races of schreiberi since one specimen from Assam agrees with Kanara specimens, ignoring the differences pointed out by Rothschild and Jordan based on long series.
		wardi ..		S.		
	jalysus, Fd.		....	S.-B.		
	moori ..	sandakanus, Früh.		As.-B.	= marginalis, Roth. s. f. or var.	
(Murware-da).	delphis, Db.		....	As.-Up. B.		
		concha, Wd.,		S.-B.		
	dolon, Wd.		....	W.-Him.		
		centralis, Roth.		Sik.-As.	Früh separates the Assam form as magniplaga.	
		grandis, Roth.		Shan St.		

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Note.
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Nymphalidæ.
—contd.

Nymphaliniæ.—contd.

<i>Eupis</i> (Murwareda) —contd.	<i>nepenthes</i> , G.S. eudamippus, Db.	Shan St.			
				nigrobasalis, Lathy.	Shan St.	
<i>Holcyra</i> ..	hemina, Hew.	....	Sik.-B.			
<i>Dilipa</i> ..	morgiana, Wd.	....	Kulu-Up.B.		.....
<i>Apatura</i> .. (Apatura) ..	ambica, Kohl.	....	Kash.-Ten.	bhavana M., may be a variety or a seasonal form.		The Chitral form of ambica deserves a name, <i>chitraensis</i> ; it is much larger, on the forewing below the round spot in 2 is absent; the male has a white spot on the costa of the forewing above; the female has the white submarginal spots very large and diffused. The differences in markings may be inconstant but the difference in size is very striking.
		chitralensis, Ev.	Chit.			
	ilia ..	here, Fd.	N. Shan St.			
(Mimathyma) ..	chevana, M.	....	Sik.-Up. B.			
(Chitoria) ..	sordida, M.	....	Sik. B.			
(Dravira) ..	niupi, Doh.	....	Up As.	fulva, Leech, is a race of this.		
	pallas ..	florenciae, Tytler.	Naga H.			
(Eulaceura) ..	osteria, Wd.	....	Ten.			
(Narsenga) ..	parvata, M.	....	Sik.-As.			
(Rohana) ..	parisatis, God.	....	Kum.-Ten.			
		camiba, M...	S. C.			
<i>Heronia</i> ..	marathus, Db.	....	Sik.-Up. B.			
		angustata, M. andamana. M.	S. B. An.			
<i>Hestina</i> ..	nama, Db.	....	Muss.-B.	melanina, Fruh., a meanitic ab.		
<i>Parhestina</i> ..	persimilis, Wd.	....	Sik.-As.	I have an ab. of this all black.		
		zella, But. ..	Simla-Kum.			
	mena ..	nicevillei, M. jernyni, Druce.	Chumba. Muss.	? a separate species.		
<i>Euripus</i> ..	halitherses, Db.	....	Sik.-M.	female=isa, M. ha-liastus, But.		Euripus halitherses has two dimorphic females; the first may be called halitherses (= isa M. ha-liastus, But.) and has a white band on the forewing with more or less white on the hindwing; the second (= a cathæoides, DeN.) has no white on the forewing, the hindwing is more or less white and often bears submarginal spots. The form cinnamomeus, M., is merely a variety of a cathæoides and differs in having some white on the dorsal margin of the forewing, while the whole of the outer half of the hindwing is white.

(female d. a cathæoides, DeN.)
(female v. = nyctelius, Db. cinnamomeus, M.)

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
NYMPHALIDÆ. —contd.		NYMPHALINÆ.—contd.				
Euripus (Rohana) —contd.		consimilis, —contd. Wd.	....	Dun-B.		
			meridionalis, WM.	S.		
		funebri, Leech.	....	Naga Hills, China.	obtained by Maj. Tytler.	
Sephisa	dichroa, Koil.	....	Chit-Kum.		
		chandra, M.	....	Kum-B.	.....	Sephisa chandra has 3 forms of female viz., I, uniformly dark = chandra; II with the hindwing white = albina, nov.; and III with a white preapical band on the forewing, the hindwing being dark = chandra, nov. Whether these forms should be looked upon as varieties or dimorphs seems doubtful.
				(female chandra-rana, Ev.) (female albina, Ev.)		
Stibochiona.	nicea, Gray.	....	Kulu-B.		
			subucula, Fruh.	Karen H.		
Dichorragia.	nesimachus, Bdl.	....	Kulu-B.		
Neurosigma.	doubledayi, Wd.	....	Sik-Up. B.	Siva, Wd: female = fraterna, M.	N. nonius was described by DeN in Ann. N. H. XVII, 396 (1896) and De N. pointed out in J. B. N. H. S. XII, 329, that Moore had overlooked it: Bingham also omitted nonius.
			nonius, DeN.	S. B.		
Abrota	ganga, M...	....	Sik.		Stichel unites ganga and confinis but Fruhstorfer again separates them.
		confinis, Fd.	....	Sik.-Bhut.	—jumna, M. and ? mirus, Fab.	
Adolias	dirtea, Fab.	....	B.	Fruh. separates eleanor, S. Burma and pardalis, M. Mergui.	
			hasiana, Sw.	As.		
			eleanor, Fruh.	S. B.	.....	Moore is followed as regards the name Adolias for dirtea, etc.; Bing. uses Synphaedra, here used for nais as done by Moore.
			pardalis, M.	Mergui.		
		cyanipardus, But.	....	Sik.-As.	Bing. as race of dirtea.	
Euthalia .. (Bassarona)		teuta, Db.	....	Sik.-B.	=ira, M. ? the race from S.B.	Bing. separates Dophla for what DeN. called the first section of Euthalia.
		teutoides, M.	An.			
		recta, DeN.	....	As.-B.		
		goodrichi, Dist.	....	S. Ten.	Bing. as race of teuta.	
			gupta, DeN.	B.		

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		NYMPHALINÆ.— <i>contd.</i>				
— <i>contd.</i>						
Euthalia.	(Labranga).	durga, M.	....	Sik.-Bhut.		
— <i>contd.</i>		duda, Std.	....	Sik.-As.	Seitz = 'durga.	
	(Limburga)..	nara, M. ..	....	Sik.-As.		
	(Mahalda)..	sahadeva, M.	....	Nep.-As.		
		narayana, Gr. S. & Kir.		B. (Ruby Mines.)		
		iva, M. ..	....	Sik.-As.		
	(Zalapia) ..	patala, Koll.	....	Chamba- Nep.		
		taoana, M...		S. B.		
	(Dophla) ..	evelina, Stall.	....	C.		
		audabilis, Sw.		S.		
		derma, Koll.	....	Syl.-B.		
	(Rangara)..	dunya, Db.	....	S. Ten.		
	(Cynitia) ..	co c y t u s, Fab.	....	B.		
		lep i d e a, But.	....	Kum.-B.S.		
		andersoni, M.		Ten.		
	(Saparona).	cibari t i s, Hew.	....	An. Ni.		
	(Haramba).	appia d e s, Mén.	... .	Sik.-Up. B.	.....	In spite of all that has been written, I believe that sedeva and adima are well defined local races of appiades: adima only occurs at high elevations while sedeva is only found at low elevations.
		sedeva, M. ..		As.-Up. B.		
		adima, M. ..		Khasi-Up. B. (hills).	=khasiana, Sw.	
		j u l i i, Bou- gain.		S. B.		
		jahuu, M..	....	Sik.-B.		
	(Chucapa)..	fr a n c i æ, Gray.	....	Nep.-B.	.... .
	(Tasinga) ..	anosia, M..	....	Sik.-B.		
	(Nora) ..	kesava, M..	....	Sik.-Up. B.		
		rangoonensis, Sw.		S. B.		
	(Kirontisa).	telchi n i a, Mén.	....	Sik.-As.		
	(Euthalia)..	phem i u s, Db.	....	Sik.-B.		
		zichri, But.	....	S. B.		
		bingha m i, DeN.	....	Ten.		
		lubenti n a, Cr.	....	Dun. B. Centrl. I.S.C.		
		garuda, M..	....	N. I. B.		

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		NYMPALINÆ.—contd.				
—contd.						
Euthalia	(Euthalia)	....	diversa, Ev.	S. C.	.....	I propose to call the Southern form of garuda, <i>diversa</i> ; though the male is very much the same, the female differs in the following respects: there are always 5 white spots on the forewing and the apical spot always seem to have an outward tendency whereas in the Ne form these apical spots have an inward tendency being often joined to the inner discal spots. On both wings the outer area is prominently paler.
—contd.	—contd.		acon ti u s, Hew.	An.		
		vasanta, M.	....	C.	.....
		jama, Fd. ..	....	Sik.-B.		
		a p i c a l i s, Voll.	....	As.-B.		
		eriphyl a e, DeN.	....	As.-Ten.	This is a distinct species.	
		kanda, M. .	....	Ten.		
		nais, Fors-ter.	....	Him.-S.C.		
Parthenos.	....	gambrisius, Fab.	....	E. Beng.-B. An. Ni.		
		(V. apicalis, M.)				
		virens, M. .	....	S.		
		cyaneus, M. .	....	C.		
Liminitis .. (Moduza) ..		procris, Cr.	....	I. B.	.....	Liminitis is here extended to include the closely allied genera Moduza and Auzakia.
		anarta, M. .	....	An. S. B.		
		calidasa, M.	....	C.		
	(Parasarpa)	zayla, Db. .	....	Sik.-As.		
	(Sumalia) ..	dudu, Wd. .	....	Sik.-B.		
		zulema Db.	....	Sik.-B.		
		daraxa, Db.	....	Kum.-B.		
	Najas) ..	trivena, M.	....	Kash.-Muss.	} The two forms intergrade in Kashmir.	
		ligyes Hew. .	....	Chit.-Kash.		
	(Auzakia) ..	danava, M.	....	Muss.-Up. B.		
	(Bhagadat- a u s t e n i a, ta.)	M.	....	Cach.-As.		
Lebadea ..	....	m a r t h a. Fao.	....	As.-B.		
		ismene, Db. .	....	Sik.-Bhut.		
		attenuata, M.	....	Ten.		
Pantoporia. (P a n t o p o - n e f t e r i a.)		.. inara, Db. .	....	Sik.-Up. B. oriss. S.	.....	Pantoporia is here extended to include the genus separated by Bingham as Athyma.
		asita, M. .	....	S. B.		
		nivifera, But	....	Mergui.		
		rufua, DeN.	....	An.		
	selenopho- ra, Koll.	....	....	Muss.-B. S.		
	zeroca, M. .	....	....	Kum.-B.		
	cama, M. .	....	....	Muss.-B.		
	kresna, M. .	....	....	As. B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		NYMPHALINÆ.—contd.				
—contd.						
Pantoporia.	(Tatisia) ..	kanwa, M.	....	As.-B.		
—contd.						
	(Parathy -	sulpitia, Cr.	....	B.		
	•ma.)					
	(Kironga) ..	ranga, M...	....	Sik-B. S.		
		abiassa, M...	....	Mergui.		
	Condocha-	Opalina,	....	Kash.-Kum.		
	tes.	Koll.				
		orientalis, El.		Sik-B.		
	(A'hyma) ..	perius, L...	....	I. B.		
	(Taco'a) ..	larymna,	....	Ten.		
		Db.				
	(Tacoraæ).	asura, M...	....	Kulu-B.		
		idita, M.	..	Mergui.		
	(Chendra- na.)	pravara, M.	....	Cach.-B.		
	(Tharusia).	jina, M. ..	....	Nep.-Sik.		
Neptis	.. (Neptis)	hylas	..	varmona, M.	I. C. (plains).	eurynome, L. Chi- na.
		astola, M.	..	Him.-Up. B.		
				(hills).		
		adara, M.	..	S. B. Ten.		
		andamana, M.		An.		
		nicobarica, M.		Ni.		
		soma, M. ..	....	Muss. B.	Stichel & DeN. as nandina, M.	
		clinia, M.	..	An.	=mananda, M.	
		hampsoni, M.		Ni.		
		kallaura, M..		N. Kan.- Trav.		
	yerburii, But.	....		Kash.-Up. B.		
	mahendra. M.	....		Chit.-Kum.		
	nata, M. ..	....		B.		
(Andrapa- na).	magadha, Fd.	....		B.	.....	The races of columella given here seem well founded; from the Nicobars there is 1 female in the B. M. for which I pro- pose the name <i>kankena</i> ; it is considerably larger than the continental forms and below differs considerably, all the white markings, especially the marginal ones being more de- veloped; the lunular band beyond the submarginal band on the hindwing forms a series of deep crescents.
	columella, Cr.	khassiana, M..		Bhut.-Up. B.		
		....		Dun.-Up. B.		
		nilgirica, M..		Centr.-S.		
		martabana, M.		B.		
		kankena, Ev.		Ni.		

Genus.	Sub-genus.	Species.	Rare.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ— <i>contd.</i>		NYMPHALINÆ.— <i>contd.</i>				
Neptis.	(Andrapana) — <i>contd.</i>	jumbah, M.	....	Beng.-S.C. S.B.-An.		
	(Bimbisara)	cartica, M.	....	Sik.-As.		
		nashona, Sw.		Khasi.		
		burmana, DeN.		B.		
		sankara, Koll.	....	Kash.-Kum.	.....	The form quilta is not a very satisfactory one; sankara gradually changes from the Western Himalayas to Burma and it is difficult to define the limits of any particular race; the Burmese form differs just as much from the Assam form, as the latter does from the W. Himalayan form; in Sikkim typical sankara and quilta occur.
		quilta, Sw.	..	Sik.-B.		
		harita, M.	..	An.		
		nar, DeN.	..	E. Beng.-B.		
		vikasi	..	pseudovikasi, M.	Kum.-As.	
		anjana, M.	...	S. B.		
		ebusa, Fd.	....	Ni.	.....	There are 3 specimens of ebusa, a Philippine insect, in the B. M. from the Nicobars.
		fuliginosa, M.		Ten.		
(Stabrobrates.)		manasa, M.	....	Sik.	= nyctea, DeN.	The type of manasa remains unique and I am convinced that nyctea is inseparable from it. There is a Neptis in the B. M. from Sikkim and I have 2 others caught there with nyctea, which I propose to call <i>meiba</i> ; above it is similar to narayana but the spot at base of 3 is missing on the forewing; below it is pale ochraceous marked as narayana but the marginal lines on the hindwing and the apical margins on the forewing are obsolete. The type of meiba is in the B. M.
		melba, Ev.	....	Sik.		
		narayana, M.	....	Kulu-Kum.		
		nana, DeN.	..	Sik.-Bhut.		
		asterastilis, Ober.		Up. B.		
		zaida, Db.	....	Murree-Sik.		
		ananta, M.	..	Chamba-B.		
		radha, M.	....	Kum.-Up B.		
		ananta, M.	....	Chamba-B.		
		miah, M.	....	Sik.-As.		
		nolana, Druce.		B.		
		viraja, M.	....	Kum.-B. Orissa, S. Cach.-B.		
(Lasippa)	..	heliodore, Fab.	..			
(Rahinda)	..	hordonia, Stoll.	....	I. B.	.....	Mr. Bell, in N. Kanara, has found that hordonia has 2 forms of larva possibly representing 2 separate species.
		sinuata, M.	..	C.		

A LIST OF INDIAN BUTTERFLIES.

579

Genus.	Sub-genus.	Species..	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ.		NYMPHALINÆ -contd.				
-contd.						
Neptis.	(Rahinda).	enacalis,	....	An.-Ni.		
-contd.	-contd.	Hew.				
		peraka,	....	As.-B.		
		But.				
		dindinga,	....	S. B.	seems to be a distinct species.	
		But.				
		aurelia,	....	As.-B.		
		Std.				
		assamica,	....	As.		
		M.				
Cyrestis ..	(Cyrestis) ..	thyodamas,	....	I. B.		
		Bdl.				
		andamanica,		An.		
		WM. & DeN.				
		nivea ..	nivalis, Fd.,	B.	nivea, Z.S., Malay Penin.	
		tabula,	....	Ni.		
		DeN.				
(Apsithra) ..	periander,	....	Mergui.			
	Fab.					
		binghami,		Ten.		
		Martin.				
		cocles, Fab.	....	Sik.-B., Godaveri.	=natta, Sw.,	.. The forms of cocles appear to be seasonal.
		andamanica,		An.		
		WM. & DeN.				
(Chersone-	peraka,	....	Ten.			
sia).	Dist.					
	risa, Db. ..	....	Kum.-B.	.....		Cyrestis is here extended to include the closely allied Chersone-
						nesia.
		rahria ..	rahrioides, M.	Ten.	quite separate from risa.	
Junonia ..	....	iphita, Cr.	....	I. B. C.		
		lemonias,	....	I. B. C.		
		I,				
		hierta, Fab.	....	I. B. C.		
		orithyia, L.	....	I. B. C.		
		atlites, Joh.	....	I. B. C.		
		alhmana, L.	....	I. B. C.		
Vanessa ..	(Vanessa) ..	cardui, L.	....	I. B. C.		
		indica,	....	N. I.-B.		
		Herbat.				
		nubicola,		S. C.		
		Fruh.				
(Kaniska) ..	canace, Joh.	....	Chit.-B. S.			
		haronica, M.		C.		
(Eu vanes-	antiopa, L.	....	Sik.-Bhut.			
sa.)						
(Aglaia) ..	cashmirensis,	....	Chit.-Sik.	.....		Stichel puts rizana and ladakensis as races of urticae, but they seem to fly together; he puts cashmirensis separate, stating that its larva is different.
	Koll.					
		urticae ..	rizana, M. ...	Chit.-Sik.		
		ladakensis,	....	Kash.-Sik.		
		M.				
(Eugonia) ..	xanthome-	....	Chit.-Kum.	=fervescens, Stich.	Stichel gives xanthome-	
	las,			and fervida,	scens, Stich. and polychloros	
				Stdfss.	fervida, Stdfss. as both from	
					India: I do not think there	
					is more than one form occur-	
					ring in India, inseparable from	
					xanthomeias.	
(Polygonia).	v. alb um,	....	Chit.-Kash.	=vau-album, Wv.		
	Fab.					

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HYMPHALIDÆ		NYMPHALINÆ—contd.				
—contd.						
Vanessa	Polygonia	c. album...	interposita, Stoll.	Bil.-Chit.		
—contd.	—contd.		cognata, M...	Kash.-Kum.		interposita is usually regarded as a race of egea, Cr, but if the Chitra form is really egea, it runs into cognata. In the B. M. interposita is placed as a form of c. album.
			agnicula, M.	E. Kum.-Bhut.	=tibetana, El.	
Araschnia.	....	prorsoides..	dohertyi, M	Manipur.		
				Naga H.		
Symn-brethia.	....	hippoclus..	lucina, Cr. ..	Sim a B. E. ghats.	=khasiana, M. ..	Fruh. confines lucina to China and gives khasiana as the Indian form
			hypselis ..	cotanda, M...	Kum.-As.	hypselis, God., Sinis, DeN., was originally described as the Indian race of hypselis; Fruh. separates the Assam form as assama, Fruh., and gives sinis from Ten.
			sinis, DeN...	Ten.		
			brabira, M.	....	Kash.-Sik.	Fruh. separates the Sikkim form as sivokana, M.
			niphanda, M.	....	Sik.-B.	
			(v. silana, DeN.)			Bingham. as a race of niphanda
Prothoe. ..	(Prothoe)..	francki ..	angelica, But.	S. B.		
			regalis, But.	Up As.		
	(Agatara) ..	calydonia..	belisama, Crow.	S. B.		
Rhinopalpa	....	polynice ..	birmana, Fruh	Cash.-B.		
Yoma ..	....	sabina ..	vasuki, Doh.	B.		
Hypolimnias.	....	bolina, L...	....	I. B. C.		
		misippus, L.	....	I. B. C.	female =diocippus, Cr.	
			(female d. inaria, Cr.)			
			(female v. acippoides, But.)			
Penthema..	....	lisarda, Db.	....	Sik.-Up. B.		
		darlisa, M..	....	S. B.		
		binghami, W.M.	....	Ten.		
Doleschallia.	....	bisaltide ..	continentalis, Fruh.	Sik.-B.	.....	There is not sufficient material in the B. M. to judge whether these races are worth retaining.
			malabarica, Fruh.	S.		
			ceylonica, Fruh.	C.		
			pratipa, M...	Ten.		
			andamanensis, Fruh.	An.		
Kallima.	....	inachus. Bdl.	....	Kum.-As. Centr. I		
			huegeli, Koll.	Kash.-Muss		
			limborgi, M..	B.		
		horsfieldii, Koll.	....	S.	=wardi, M.	
			philarchus, Wd.	C.		
			alompra. M..	B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		NYMPHALINÆ- contd.				
- contd.						
Kallima	....	knyveti, DeN.	....	Sik.-B.		
- contd.		albofasciata, M.	....	An.		
Cerinos ..	....	clarissa, Bdl.	....	Ten.		
Gynthia ..	....	erota, Fab..	....	Sik.-B.	= pura, Sw.; circe, Faw.	
		saloma, Sw...		S.		
		asela, M. ..		C.		
		pallida, Std..		An.		
Esoria ..	....	sinha, Koll.	....	Muss.-B. Oriss.		
Atella ..	....	phalanta, Drury.	....	....
		alcippe ..	alcippoides, M.	Sik.-B. S. An.		
			ceylonica, Manders.	C.		
			fraterna, M..	Ni.	hardly worth separating	
Eupha ..	....	erymanthis, lotis, Sulz. ..	....	Muss.-B. Ni.	erymanthis, Drury, Malay Peninsula; nicobarica, Fd., not separate.	
			andamanica, M.	An.		
			maja, Fruh..	S.		
			placida, M. ..	C.		
Cirrochroa. (Ducapa) ..	fasciata, Fd.	....	....	Ten.	= flavobrunnea, Cr., S.	
(Cirrochroa.)	bajadeta, M.	....	....	S. Ten.		
		nicobarica, WM. & DeN.	....	Ni.		
	thais, Fab..	....	....	S.		
		lanka, M. ..	....	C.		
	surya, M...	....	....	Ten.		
	mithila, M.	....	....	Sik.-B.		
		anjira, M. ..	....	An.		
	aoris, Db...	....	....	Sik.-Bhut.		
		jiraria, Sw...	....	As.		
		olivacea, DeN.	....	B.		
Argynnis .. (Acidalia) ..	hyperbius, Joh.	....	....	Chit.-Up B. Centr. I.	= niphe, L.	
		hybrida, Ev..	....	Nilgiris.		
		castetsi, ober.	....	Paini, Trav. Hills		
		taprobana, M.	....	C.		
(Argynnis).	childreni, Gray.	....	....	Kum.-Up B.	....
		sakontala, Koll.	....	Chit.-Kum.		
	maia, Cr...	....	....	Chit, Gilgit.		
	kamala, M.	....	....	Chit.-Kum.		

The Nilgiri form of *hyperbius* seems to deserve a name and I propose *hybrida*; the male is similar to the Paini male in having the veins of the forewing dilated, but the female resembles the female of normal *hyperbius*, though smaller and paler.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		NYMPHALINÆ—contd.				
—contd.						
Argynnis	(Argynnis)	laodice	.. rudra, M.	.. As-Up. B.	.....	The Ladak form of jainadeva separate as pallida. It is much paler and smaller than jaina deva.
—contd.	—contd.					
		aglaia	.. vitatha, M...	Chit.-Kash.	.....	Vitatha is the name for the small pale form of aglaia occurring at high elevations (10,000 to 13,000) in Kashmir and Chitral. In the valleys at the Southern end of Chitral, particularly in the Ashreth Valley occurs a large form with bright fulvous male; the female is darker and in some cases is entirely covered with dark purple scales (figured by DeN in J. B. N. H. S., XIV 236). I propose the name ashretha for this form; it occurs at about 6,000 to 8,000 feet.
			ashretha, Ev	Chit.		
		adippe	.. jainadeva, M.	Chit.-Kum.		
			pallida, Ev...	Lad.		
	(Rathora) ..	lathonia	.. issoca, Db.	.. Chit.-Up.B.		
	(Boloria) ..	gemmata, But.	....	Sik.		
		altissima, El.	....	Sik.-Bhut.		
			mackinnoni, DeN.	Muss.		
		jordoni, Lang.	....	Kash.		
			chitralensis, M.	Chit.		
	pales	.. sipora, M.	..	Chit.-Sik.		
			generator, Std.	N. Kash.-Lahoul.		
	hegemone, Std.	....	Chit.-Lad.	.....		The Indian form of hegemon differs from Central Asia specimens but as there are only 3 specimens in the B. M. its separation is not justified.
		clara, Blanch.	....	Garhwal.		
			manis, Fruh	Sik.		
Melitæa	(Mellicta)	sindura, M.	....	Lad.-Kum.		
		balbita, M...	Kash.	.....		balbita from Kashmir is a much larger and more brilliant race than sindura or sikkimensis. the Chitral form is as brilliant as balbita but is much smaller and the dorsal band is more complete: I propose to call it balba.
			balba, Ev. ...	Chit.		
			ikkimensis, M.	Sik		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		NYMPHALINÆ—contd.				
—contd.						
Melitæa —contd.	(Melitæa).	didyma ..	chitralensis, M.	Chit.	.....	The small Melitæa found in N. W. India, though variable, should stand as perseæ: the Chitral form, found at all elevations I call <i>mixta</i> , it is far more variable and usually more brightly coloured than perseæ. As <i>mixta</i> and <i>chitralensis</i> fly together and undoubtedly belong to separate species they cannot both be races of <i>didyma</i> .
		trivia ..	perseæ, Koll. ..	Bil.-Punj.	—dodgsoni, Gr. S.; robertsi, But.	
			mixta, Ev. ..	Chit.		
		saxatilis ..	shandura, Christ.	Chit.	.....	Some years ago I sent Col. Bingham several specimens of a Melitæa from Chitral which he identified as <i>saxatilis</i> shandura Christoph: similar specimens have been arranged by Elwes in the B.M. as <i>maracandica</i> with a note "near ferghana, all are probably varieties of <i>saxatilis</i> ." Seitz makes no mention of shandura and I have been unable to trace Christoph's description, but as my specimens were caught in the neighbourhood of the Shandur Pass I presume that they are identical with the form described by Christoph.
lybia ..	....	ilythia, Drury.	....	Centr. I. S., C		
rgolis ..	....	ariadne, Joh.	....	I. B. C.		
		merione, Cr.	....	N. I. B. Centr. I. S. C.		
			taprobana. Wd.			
aringa ..	....	castelnaui, Fd.	....	Ten.		
		horsfieldii, glaucescens, DeN.		B.		
			andamanica, DeN.	An.		
seudergo- lis ..	....	wedeh, Koll.	....	Kash.-B.	.....	Bingham places Cethosia between Cynthia and Atella: Seitz puts it in a "tribe" by itself, viz. Heliconidi after all the Nymphalidæ just before the Acraeidi; it seems better placed near the Acraeinae than anywhere else.
alinaga ..	....	buddha, M.	....	Murree. Kulu. Sik. As.		
			gautama, M. brahma, But.			
			sudassana, Mel.	B.		
ethosia ..	....	cyane, Dru- ry.	....	Muss-B. Oriss. S. Ten.		
		hypseæ ..	hypsinæ, Fd.			
		biblis, Dru- ry.	....	Sik.-B.	thebava, Gr. S. an ab.	
				(female v, viridiana, Fruh.)		
			nico barica, Fd.	Ni.		
			andamanica, Stich.	An		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYMPHALIDÆ		NYMPHALINÆ—concl'd.				
—concl'd.						
Cethosia	nietneri,	....	C.		
—concl'd.		Fd.		S.		
		mahratta, M.				
ACRÆINÆ.						
Pareba	vesta, Fab.	....	Chamba-B.		
Telchinia	violæ, Hub.	....	I. C.		
LIBYTHÆINÆ.						
Libythea	c e l t i s ,	....	Chit.		
		Fuess.				
		lepita, M.	..	Kash.-Up.B.		
		lepitoides, M.		S. C.	.....	The 2 forms of myrrha are usually united and doubtless this is correct, but the wide banded form prevails in N. India and the narrow banded form in Ceylon: the forms may be seasonal.
		myrrha ..	rama, M. ..	Kulu.-B. S. C.	Myrrha, God. Java, Fruh. separates the N. form as sanguinalis.	
		rohini, Mar.	....	As.	? race of narina, God. Amboina.	
		libera, DeN. .		B.		
		geoffroyi ..	alompra, M. .	Ten.		
		(v. hauxwelli, DeN.)				
NEMEOBIDÆ.						
Dodona	durga, Koll.	....	Kash.-Nep.		
		dipcea, Hew.	....	Kulu.-As.		
		d r a c o n ,	....	Shan St.		
		DeN.				
		e u g e n e s ,	....	Murree-As.		
		Bates.				
		egeon, Db.	....	Kash.-As.		
		ouida, M. .	....	Muss-Up.B.		
		a d o n i r a ,	....	Nep.-Up. B.	.....	Longicaudata grades through deodata and binghami to angela: the material in the B. M. is very limited but I do not think that the last two are more than seasonal forms of deodata.
		Hew.				
		d e o d a t a ,	....	B.	= binghami, M., & angela, Gr. S.	
		Hew.				
		longicaudata, DeN.		As.		
Zemeras	flegyas, Ct.	....	Muss-B.		
		o n f u c i u s ,	....	Ten.		
		Fruh.				
Taxila	burnii, DeN	....	Up. B.		
		t h u i s t o ,	..	S. B.		
		Hew.				
		haquius..	fasciata, M. .	B.		
Abisara	fylla, Db. .	....	Muss.-B.		
		n e o p h r o n ,	....	Nep.-B.		
		Hew.				
		chela, DeN.	....	Sik.-As.		

(To be continued).

SOME MAYMYO BIRDS

BY

MAJOR H. H. HARRINGTON.

PART II.

*(Continued from page 1011 of Vol. XX.)*No. 25. *Garrulus leucotis*, Hume.—(The Burmese Jay.)

On the 10th April I visited the spot where last year I had been so fortunate with the Jays, and found the Colony still established in their old place; last year's nests being still there, and six new ones, I was unfortunately a few days too early as most of the nests only contained one or two eggs. Two nests were placed on stumps 3 and 4 feet from the ground, and eleven paces apart. I again visited my "Jay farm" on the 24th and was successful in getting some more eggs. Although I explored the jungle round Maymyo I never came across another colony; only finding single nests. Owing, no doubt, to the early rains this year, the Jays began nesting sooner than last year, when most of my nests were found in May.

No. 176. *Micornis rubricapillus*, Tick.—(The Yellow-breasted Babbler.)

I did not see this noisy little bird actually in Maymyo itself, but on the 3rd May at Wetwun I found two nests with two and three incubated eggs. It is very partial to bamboo jungle, and if the locality is suitable its monotonous "Chuk, Chuk, Chuk" is generally to be heard.

No. 290. *Otocompsa flaviventris*, Tick.—(The Black-crested Yellow Bulbul.)

I did not come across this handsome Bulbul in Maymyo, but a few miles out on the Thondoung road and again at Wetwun it is very plentiful.

No. 515. *Oriolus tenuirostris*, Blyth.—(The Burmese Black-naped Oriole.)

This is the only Oriole I noticed round Maymyo, where it is extremely plentiful, many nesting in compounds. I found five or six nests both with eggs and young, and would probably have found more if I had tried, as they are extremely partial to nesting under the protection of Drongos of either kind. I noticed this more particularly in compounds, where if there happened to be a King-Crow's nest and any Orioles were heard in the vicinity, it was almost a certainty that their nest would be near that of the Drongo. Outside my gate I found both the Oriole and Red Turtle Dove (*E. tranquebarica*) nesting in a tree next to that in which a pair of King-Crows (*D. ater*.) had theirs. As a further illustration a friend told me that he had a King-Crow's nest near his house, and on hearing an Oriole calling in the garden I said most probably the nest would be near that of the King-Crow, and sure enough on going to the clump of Oaks out flew an Oriole and we soon spotted the nest suspended a good bit below that of the King-Crow.

Last year I found a number of *Æ. tranquebarica* nesting in the proximity of nests both *D. ater* and *cineraceus*.

On my return to Mandalay I found a nest of (*O. tenuirostris*) in my compound containing two eggs, which were unfortunately on the point of hatching, and also noticed many other birds about. The majority of nests were placed from ten to twelve feet from the ground, one was, however, a good twenty-five feet up. The eggs are of the usual Oriole type, being very pink when fresh, becoming a dull white when well incubated. Average of six eggs $1.15 \times .86$. Largest egg $1.2 \times .88$, smallest $1.12 \times .86$.

No. 935. *Pitta cucullata*, Hartz.—(The Green-breasted Pitta.)

Mr. T. Hauxwell caught one in his house and kept it alive sometime, feeding it on worms which it ate greedily.

No. 1178. *Scops bakkamæna*, Penn.—(The Collared Scops Owl.)

On the 27th March I found a nest containing 3 incubated eggs and secured the parent bird.

No. 1183. *Glaucidium cuculoides*, Vig.—(The Large Barred Owlet.) Plentiful, heard and seen on several occasions.

No. 1212. *Spizaëtus limnaëtus*, Horsf.—(The Changeable Hawk-Eagle.)

Mr. Hauxwell procured a nest containing one young bird of this species and is bringing it up. I found the nest of either this or another Hawk-Eagle containing one young bird, which was left until it should get larger, but on my next visit I found the tree containing the nest had been blown down during one of the many storms we had this year at Maymyo. On two occasions when out with Mr. Hauxwell we saw what we took to be a pair of Black Eagles (*Ichinaëtus malayensis*) but could find no signs of their nesting.

No. 1221. *Butastur liventer*, Temm.—(The Rufous-winged Buzzard Eagle.)

Although this bird is fairly plentiful round Maymyo, I was only successful in finding one nest on the 15th April; this was an untidy affair placed on an overhanging bough and contained two fresh eggs. The habits of *B. liventer* in the Shan States seems to be totally different to those given in the *Fauna of India* for birds in Lower Burma, where they seem to be found in cultivated and open country, in fact having all the habits of the White-eyed Buzzard-Eagle (*B. teesa*) in Upper Burma. In the Shan States it seems to prefer open forest land and in Maymyo to be very partial to oak jungle. It is a very conspicuous bird with its bright chestnut upper plumage, and almost white underparts. *B. teesa* was seen in the open country to the west of the railway station.

No. 1251. *Baza lophotes*, Temm.—(The Black-crested Baza.)

On the morning of the 29th April, whilst birds nesting near the banks of the river at Wetwun, my attention was attracted by the noisy clamouring of a pair of Baza, who kept flying round a clump of trees, and settling side by side on a dead bough where they continued calling and raising their

crests, so it was clear they had a nest somewhere near. The cause of the disturbance seems to have been a troop of monkeys in the jungle below, which on our approach disappeared. Soon after this the birds quieted down, one going into the next tree where it settled on the nest, which was placed near the extremity of a branch, quite a hundred feet above ground, looking very like a large King-Crow's nest. I sent my Burmans up the tree to see if anything could be done; they fortunately managed to get above the nest and reported two eggs, also saying owing to the thinness of the bough it would be impossible to reach the nest; we then returned to the village to try and make arrangements. One of the Burmans produced a piece of black sticky bees' wax, and proceeded to demonstrate his plan, by picking up with the aid of the wax a large hen's egg at the end of a long bamboo. Our plan was then to use an old cap placed at the end of another bamboo as a receptacle which was to be placed alongside the nest, the eggs to be then lifted carefully into it. On our return the bird was still to be seen sitting on the nest; and after a little more practice with the hen's egg, the men went up the tree, whilst I anxiously waited below. The plan turned out quite a success, and both eggs were brought safely down. The next step was to procure one of the parent birds. This could easily have been done while the men were up the tree, but after the eggs had been taken both birds disappeared. One however (male) returned and was bagged for identification purposes. The Burmans reported the nest to be about a foot in diameter and lined with green leaves. The eggs which were well incubated are a dull chalky white and measure 1.5×1.3 and 1.48×1.25 .

I think that *B. lophotes* is fairly plentiful in this part of the Shan States, as I saw one at Thondoung one evening sitting on a dead branch of a tree, and last year on the march up to Maymyo I saw a pair of birds in the jungle near where the Zig-Zag mounts the Ghats.

NOTES ON BUTTERFLIES FROM THE NAGA HILLS.

BY

MAJOR H. C. TYTLER, 17TH INFANTRY.

(With Plate B.)

PART II.

(Continued from page 65 of this Volume.)

FAMILY—PAPILIONIDÆ.

188. **Armandia lidderdali**, *Atkinson*.—Males not uncommon, females rare, at 5,500 ft.—7,000 ft. during the latter half of August, September and the first half of October. The first specimen was obtained on 19th August and the last on November 10th. Perfect males were only obtainable till about 20th September, after that the majority of the specimens were damaged. Most of the females taken were perfect. The butterfly though not uncommon is rather local and keeps to the higher ridges. Many specimens were captured on a white flowering tree which comes into blossom towards the middle of September. Two females after capture laid eggs which were yellow and appeared very small for the size of the insect. The flight is graceful and the insect is not difficult to capture when it occasionally comes down to within reach of the net, but as a rule it keeps high up amongst the tree tops.

189. **Leptocircus curius**, *Fabr.*—Taken commonly throughout the year at low elevations.

190. **Leptocircus meges**, *Zincken-Sommer*. Race, *indistincta*, n.—This differs from the Burmese form *Z. virescens*, Butler, and typical *Z. meges* from the Philippines in having on the underside of the hindwing the tornal area much greyer and the three white transverse bands blurred and not clearly defined.

Taken not uncommonly at 4,000—5,000 ft. from April to October and single male at Gaspani, 1,700 ft., in July.

191. **Teinopalpus imperialis**, *Hope*.—Many males taken at 7,000 ft. in September; no females were seen.

192. **Papilio cerberus**, *Felder*.—Not uncommon at the foot of the hills from March to August.

193. **Papilio æacus**, *Felder*.—Taken sparingly at the foot of the hills in March and June and at 7,000 ft. in August.

194. **Papilio aristolochiæ**, *Fabr.*—A few specimens taken at the foot of the hills in July and August and December.

195. **Papilio astorion**, *Westw.*—Taken sparingly from March to November at the foot of the hills and at Kohima.

196. **Papilio aidoneus**, *Doubleday*.—Rather rare; three males taken at the foot of the hills and at Kohima in February, August and September.

197. **Papilio philoxenus**, *Gray*.—Taken commonly from April to October from the foot of the hills up to 7,000 ft. The variety *polymitis* was not met with.

198. **Papilio dasarada**, *Moore*.—Two males taken at low elevations in April and November and a female at Kohima in October.

199. **Papilio demoleus**, *L.*—Specimens taken at the foot of the hills from June to November.

200. **Papilio helenus**, *L.*—Common; small cold weather forms taken at the foot of the hills in February and large summer forms at 5,000—7,000 ft. from July to November.

201. **Papilio agenor**, *L.*—Taken sparingly at low elevations from March to November. Female forms *bullerianus*, *Rothschild*, and *alcanor*, *Cramer*, were obtained.

202. **Papilio protenor**, *Cramer*.—Males common; small cold weather forms taken at the foot of the hills in February and March, large rainy season forms from the foot of the hills up to 6,000 ft. from June to September. Females rather rare.

203. **Papilio rhetenor**, *Westwood*.—Small cold weather forms taken at the foot of the hills in March and April; large wet season forms taken at 5,000—6,000 ft. in September and October. Females very rare.

204. **Papilio chaon**, *Westwood*.—A single small cold weather form taken in February and several large wet season forms in August, all at low elevations.

205. **Papilio polytes**, *L.*—Common at the foot of the hills throughout the year and a few at 4,000 ft. in July and August; the female form *cyrus* *Fabr.*, is decidedly rare.

206. **Papilio castor**, *Westwood*.—Males not uncommon at low elevations from July to September. A single female was taken.

207. **Papilio agestor**, *Gray*.—A single specimen taken in my garden at Kohima in May; several more were seen. I believe this form has not been recorded further west than Nepal but Captain Graham showed me a specimen in his collection which he informs me he captured himself at Simla.

208. **Papilio clytia**, *L.*—The *clytia* form was not obtained, but the *dissimilis* form was not uncommon at the foot of the hills from February to June.

209. **Papilio telearchus**, *Hewitson*.—Two males taken at Tamlu, 1,500—3,000, ft., and a male at Michuguard in August.

210. **Papilio danisepa**, *Butler*.—A single male of this beautiful and rare form taken at Tamlu in September and two more at Michuguard in June.

211. **Papilio elephenor**, *Doubleday*.—Six males of this rare form were obtained at Tambu in August and several specimens near Michuguard in February, March and April.

212. **Papilio triumphator**, *Frühstorfer*.—Taken rather commonly at the foot of the hills and up to 7,000 ft., from February to October. The cold weather forms taken in February and April are very small.

Ab: *mai*, n.—Several curious aberrations of the cold weather form, taken in February and April, have the patch on the hindwing brilliant green instead of blue.

213. **Papilio paris**, *L.*—Very common throughout the year from the foot of the hills up to 6,000 ft. Specimens of the spring brood taken in February and March are much smaller than the summer brood and have the bright patch on the hindwing slightly greener.

214. **Papilio krishna**, *Moore*.—A battered specimen taken by Doherty (fide Elwes). I have not met with it in these hills but have taken many specimens in the adjacent hill of Manipur at 8,000 ft. in May.

215. **Papilio arcturus**, *Westwood*.—Not uncommon at 4,600—7,000 ft.; July to October.

216. **Papilio gyas**, *Westwood*.—Males not uncommon at 5,000—6,000 ft. from July to October. No females were obtained.

217. **Papilio sikhimica**, *Heron*.—Two males taken at about 2,000 ft. in April; one of these is a curious aberration and has on the forewing the fourth transverse black band from the base quite wanting and the second band broken in the middle.

218. **Papilio alcibiades**, *Fabr.*—Very common at the foot of the hills from May to August, a few were also taken in March and April. Neither Moore nor Bingham mentions the difference in the seasonal forms which is well marked. The early spring brood taken in March and April is smaller than the summer brood and has the markings much lighter; Bingham's description of *alcibiades* applies well to this form. The summer brood taken from May to August is larger and darker than the spring brood and has the terminal black margin on the forewing produced to vein 1, and sometimes beyond it touching the dorsum; the post discal band, which in the spring form never touches the marginal band and stops at vein 3 or before it, is prolonged and joins the marginal band at vein 2 or sometimes at vein 1, thus completely enclosing the submarginal greenish white band, approaching in this respect typical *antiphates*, Cr.

219. **Papilio antierates**, *Doubleday*.—Appears to be single brooded. Common at the foot of the hills in April and a few specimens were also taken in May.

220. **Papilio azion**, *Felder*.—Not uncommon; taken at the foot of the hills from April to September.

BUTTERFLIES FROM THE NAGA HILLS.

EXPLANATION OF PLATE B.

- Fig. 1. *Una usta*, *Distant* ♂ .
„ 2. *Una usta*, *Distant* ♀ .
„ 3. *Ilerda kohimensis*, *n. sp.* ♂ .
„ 4. *Ilerda viridipunctata*, *de. N.* Race Kala, *n.* ♂ .
„ 5. *Aphnæus* ?
„ 6. *Lampides elpis*, *Godart.* ab : *Chinee*, *nov.*
„ 7 & 8. *Phengaris atroguttata*, *Oberthür* ♀ . Upper and
underside.



1



2



3



4



5



6



7



8

221. *Papilio chiron*, *Wallace*.—Not uncommon near Tamlu in August ; a male also taken near Michuguard in April.

222. *Papilio agamemnon*, *L.*—Common at the foot of the hills from February to August. A single specimen taken as high as 5,000 ft.

223. *Papilio cloanthus*, *Westwood*.—Not common, a few specimens taken at 1,700 ft. in March and at 5,000—6,000 ft. from May to September. The spring brood taken in March is much smaller than the summer brood. Specimens from these hills are somewhat larger than those from Garhwal in my collection.

224. *Papilio sarpedon*, *L.*—A very common butterfly ; taken at the foot of the hills in February, July and August and at Kohima from July to September. The spring form taken in February is smaller than the summer form and has the blue bands on both wings somewhat broader.

225. *Papilio xenocles*, *Doubleday*.—A few specimens taken at the foot of the hills in May and August.

FAMILY—PIERIDÆ.

226. *Delias descombesi*, *Boisduval*.—A few specimens taken at 1,500—4,600 ft. in August and September.

227. *Delias aglaia*, *L.*—Very common at the foot of the hills and at Kohima in February, March and July to November.

228. *Delias thysbe*, *Cramer*.—Taken rather sparingly from the foot of the hills up to 5,000 ft. in February and August to November.

229. *Delias agostina*, *Hewitson*.—Not uncommon at 1,700—5,000 ft. from July to October.

230. *Delias ithiela*, *Butler*.—Very common at 4,000—7,000 ft. in August and September ; a few specimens also taken in October.

231. *Prioneris thestylis*, *Doubleday*.—Males common, females uncommon. Dry season forms taken at the foot of the hills in April and at Kohima in October ; wet season forms taken from the foot of the hills up to 5,000 ft. from May to October.

232. *Prioneris clemathe*, *Doubleday*.—Not uncommon at Tamlu in August.

233. *Aporia agathon*, *Gray*.—A single male taken near Phiphima, 4,000 ft. in May.

234. *Pieris brassicæ*, *L.*—Rather scarce ; two males and three females taken at Kohima in February, August and October. They do not differ from specimens from the N.-W. Himalaya except that in the female the discal spot on the forewing is joined to the black apical band by veins 3 and 4 being bordered with black, the area thus enclosed is powdered with black scales. I believe this butterfly has not been recorded further east than Bhutan.

235. *Pieris naganum*, *Moore*.—A single male of this rare butterfly was

taken by my collector in March between Kohima and Nichuguard, probably at the former place itself; unfortunately the exact locality was not written on the envelope.

236. *Pieris canidia*, *Sparrman*.—Abundant throughout the year from the foot of the hills up to 6,000 ft.

237. *Pieris melete*, *Ménétriés*.—Rather uncommon, a few specimens obtained at 5,000—6,000 ft. in February, August and November.

238. *Huphina copia*, *Wallace*.—A single male of the intermediate form taken in April and two males of the dry season form (*H. dapatha*) taken in February. The wet season form was obtained in the neighbouring State of Manipur in August and September; all at low elevations.

239. *Huphina nadina*, *Lucas*.—A few specimens of both sexes taken at Kohima and Tamlu in August.

240. *Ixias latifasciata*, *Butler*.—Common; a very variable form. Two extremely small dry season forms with no black on termen of hindwing taken in February at the foot of the hills; typical wet season forms taken from September to November and intermediate forms in December at 2,000—6,000 ft.

241. *Appias nero*, *Fabricius*.—Not uncommon at low elevations; males taken in April, June, July and October. The colour is very variable, in some specimens it is orange, red and in other vermilion red.

242. *Appias hippo*, *Cramer*.—Common at the foot of the hills up to 5,000 ft.; April to October.

243. *Appias lalage*, *Doubleday*.—Rather common throughout the year from the foot of the hills up to 6,000 ft. Extreme dry season forms taken from January to March, large dark wet season forms from June to October, and intermediate forms in October and November.

244. *Appias albina*, *Boisduval*.—Rare; a single male taken at the foot of the hills in April and a female of the wet season form at Kohima in August.

245. *Catopsilia crocale*, *Cramer*.—Not uncommon; a few specimens of typical *crocale* taken at the foot of the hills in May and the form *catilla* taken from March to May and again in November.

246. *Catopsilia florella*, *Fabr.*—Common at Michuguard in February.

247. *Dercas lycorias*, *Doubleday*.—Recorded by Mr. Doherty as being rather common in June and disappearing in July (*vide* Elwes). I only obtained a pair, one in July and one in October.

248. *Colias fieldi*, *Ménétriés*.—Common in the Zulla valley 6,500 ft. in November and near Kohima July to October.

249. *Terias venata*, *Moore*.—Rather common at Kohima, August to October.

250. *Terias libythea*, *Fabricius*.—A few specimens taken at Kohima from February to August; not very common. Dry season forms taken in February have the cilia and edges of both wings pinkish.

251. *Terias laeta*, *Boisduval*.—Very common at Kohima; dry season forms taken from January to May and again in November, wet season form taken in October.

252. *Terias hecabe*, *Lin.*.—Very common throughout the year.

253. *Terias silhetana*, *Wallace*.—Not uncommon, August to November, at Kohima.

254. *Hebomoia glaucippe*, *L.*.—Common at the foot of the hills up to 2,000 ft. from February to November.

255. *Pareronia avatar*, *Moore*.—A single male taken at 2,000 ft. in July and several males and three females at 5,000—6,000 ft. in August and October.

FAMILY—LYCÆNIDÆ.

Sub-family—GERYDINÆ.

256. *Gerydus irroratus*, *Druce*.—Recorded from the Naga Hills (*vide* Bingham).

257. *Allotinus drumila*, *Moore*.—A single female taken at Jaspani 1,700 ft. in February.

258. *Allotinus multistrigatus*, *de N.*.—Taken by Doherty (*vide* Elwes).

Sub-family—LYCÆNINÆ.

259. *Una usta*, *Distant*.—Pl. ii, fig 1 ♂, 2 ♀. Originally described from Malacca and has not I believe been previously recorded from within Indian limits. Four males were taken at Gaspani, 1,700 ft., in November and a female in February. I give a description of the female which is undescribed.

Upperside: Forewing, costa, apex and termen reaching the dorsum broadly dark brown, remainder of the wing sky blue; hindwing pale brown with a slight irroration of blue scales on the disc. Underside, pale silky buff; forewing unspotted; hindwing a small costal spot in interspace 7 and a small spot at the tornal angle, a sub-marginal row of pale fuscous spots hardly discernible. Expanse 1.02 inches. The absence of the spots, in the female, which are so conspicuous in the male may be due to seasonal causes as the specimen was taken in the height of the cold weather. The spot at the tornal angle of the hindwing in the female is absent in the males taken. In the plate there is a spot on the forewing of the female which is a flaw in printing.

260. *Pithecopis hylax*, *Fabricius*.—Very common at Gaspani in February and March.

261. *Neopithecopis zalmora*, *Butler*.—A single specimen obtained at 1,700 ft. in July.

262. *Taraka hamada*, *Druce*.—A single specimen taken in October 4,000—5,000 ft.

263. *Mejisba malaya*, *Horsfield*.—Two specimens of the tailed form taken at the foot of the hills in April and May.

264. *Phengaris atroguttata*, *Oberthür*.—Pl. ii., figs. 7, 8 ♀. A single specimen of this beautiful species was taken by my collector at Yakama about 5,000 ft. either at the end of October or the beginning of November. A good number were taken by Doherty in the Kutcha Naga country from 6,000—8,000 ft. elevation.

265. *Cyaniris marginata*, *de N.*—Taken sparingly at Kohima from September to November.

266. *Cyaniris albocaerulea*, *Moore*.—Rather rare, a few males taken from August to November at 5,000—6,000 feet.

267. *Cyaniris transpecta*, *Moore*.—A single dry season male taken at Kohima in May; also a few specimens of both sexes of the wet season form from August to October.

268. *Cyaniris puspa*, *Horsfield*.—Very common; dry season forms taken from November to February and wet season forms from June to November.

269. *Cyaniris placida*, *de N.*—Many males taken at 5,000—6,000 ft. from July to September.

270. *Cyaniris diluta*, *Moore*.—Very common at 5,000 ft., September to January.

271. *Cyaniris jynteana*, *Moore*.—Very common. The seasonal forms vary considerably; typical wet season forms taken from June to October; intermediate forms from October to January and dry season forms from November to May.

273. *Bothrina chennelli*, *de N.*—This has previously been placed under the genus *Cyaniris*. Colonel Swinhoe pointed out to me that it differed from true *Cyaniris* in having veins 11 and 12 anastomosed; in *Cyaniris* they are free.

Not common, a few specimens taken at Kohima in February and October.

274. *Zizera maha*, *Kollar*.—Common throughout the year from the foot of the hills up to 6,000 ft.

275. *Zizera lysimon*, *Hübner*.—A single specimen taken at 2,000 ft. in April.

276. *Zizera otis*, *Fabr.*—Taken commonly at the foot of the hills in February, April and November.

277. *Lycaenesthes emolus*, *Godart*.—Males not uncommon at low elevations from March to November. A single female was obtained at Kohima in October.

278. *Lycaenesthes lycaenina*, *Felder*.—A single male at 1,700 ft. in October, and several males at Nichuguard during the same month.

279. *Talicada khasia*, *Druce*.—This is a well marked race of *T. nyseus*,

Guérin, very common at 6,000 ft. during October, a few also taken in September, November and December.

280. *Everes argiades*, *Pallas*.—Taken sparingly from August to November and again in February. This form varies much in size.

281. *Everes parrhasius*, *Fabr.*—A single specimen taken at Kohima in November and many specimens at Michuguard in October.

282. *Everes kala*, *de N.*—A couple taken at Maothana, on the Manipur frontier, 6,000 ft. in November, and many specimens of both sexes at Yakama from July to September.

283. *Nacaduba macrophthalma*, *Felder.*—Four males and a female taken from July to November from the foot of the hills up to 5,000 ft.

284. *Nacaduba bhutea*, *de N.*—Taken sparingly at low elevations in March, April and November.

285. *Nacaduba dana*, *de N.*—Two males in August and October at 4,000—6,000 ft. and several males at the foot of the hills in February.

286. *Nacaduba atrata*, *Horsfield.*—Males not uncommon at Kohima in June and August, females rare; a single male also taken at 1,700 ft. in April.

287. *Nacaduba prominens*, *Moore.*—Two specimens in November, at 1,700 ft. This may be only a seasonal form of *M. atrata* from which however it can easily be distinguished by its more pointed wings and the markings on the underside being less pronounced.

288. *Nacaduba nora*, *Felder.*—Taken sparingly in March at 2,000 ft. and at Kohima in August.

289. *Nacaduba moreia*, *Felder.*—A female identified by Colonel Swinhoe as belonging to this form and figured in Lep. Ind. pl. 659, fig. 2a was taken at Kohima in November; seven males also taken at Gaspani during the same month.

290. *Nacaduba coelestis*, *de N.*—Taken by Doherty in the Naga Hills but I have not met with it.

291. *Nacaduba hermus*, *Felder.*—A few males taken at Kohima in June and August and a single female in August at 7,000 ft.

292. *Lampides bochus*, *Cramer.*—Common from the foot of the hills up to 4,600 ft.

293. *Lampides cleodius*, *Felder.*—Rare, a single male of the wet season form taken at 1,700 ft. in October and a male of the dry season form at the foot of the hills in February.

294. *Lampides conferendus*, *Butler.*—Not common, taken at the foot of the hills in November and February.

295. *Lampides celeno*, *Cramer.*—Fairly common at the foot of the hills in April, October and November.

296. *Lampides elpis*, *Godart.*—Very common from the foot of the hills up to 5,000 ft. throughout the year. A very variable form which can however be divided off into four well marked groups.

(a) Typical wet season forms with the underside *grey brown* taken from April to October.

(b) An autumn form very similar to the wet season form but with markings on the upperside of the hindwing fainter and the colour of the underside *pale brown* taken in October and November.

(c) A winter form, smaller and paler than the autumn form, colour of the underside *yellow brown* with all the markings very faint and orange patch near tornus of hindwing almost absent, taken from November to February.

(d) A fourth form taken from November to April is very small and has the black on the termen of the forewing reduced to a thread and markings on the hindwing obsolescent; on the underside it is exactly like the wet season form in having the ground colour *grey brown* and the orange patch near the tail of the hindwing well marked.

Ab., *chinee* nov. pl. ii, fig. 6.

This curious aberration of form (d) has the markings on the underside more or less ringed and those near the dorsum of the hindwing absent. A single specimen taken at the foot of the hills in April.

A male of form (b) has the colour of the upperside pure sky blue with no tint of purple as in typical forms.

297. *Catochrysops strabo*, Fabricius.—A few specimens taken at Kohima, August to November, and at the foot of the hills, October to January.

298. *Catochrysops lithargyrea*, Moore.—A few specimens taken at Kohima in July and at the foot of the hills in April and May. A very small and pale extreme dry season form male with markings on the hindwing almost wanting was obtained at Kohima in February.

299. *Tarucus plinius*, Fabr.—A single female at Kohima in August.

300. *Castalius ananda*, de N.—A single male at the foot of the hills in March.

301. *Castalius rosimon*, Fabr.—Common at the foot of the hills throughout the year.

302. *Castalius ethion*, Doubleday and Hewitson.—A few specimens taken at Kohima in October and at Nichuguard in July.

303. *Castalius elna*, Hewitson.—Taken sparingly at the foot of the hills from March to July.

304. *Polyommatus boeticus*, L.—Very common at Kohima, October to February, and at Michuguard in April.

Sub-family—CURETIÆ.

305. *Curetis bulis*, Doubleday and Hewitson :—A single male taken at Michuguard in May.

306. *Caretis dextrata*, Moore.—Common at the foot of the hills. April and May.

307. *Curetis angulata*, Moore.—Very common at Kohima from August to November, a single specimen also taken at Gaspani in November. There are three well marked seasonal forms.

(a) Wet season forms taken in August and September are very dark and have the basal area of the hindwing blackish.

(b) An autumn form taken from September to October has the red rather paler and the black at the base of the hindwing reduced to a streak between veins 7 and 8.

(c) Dry season forms taken in November have the red richer and darker than the autumn forms and no black at the base of the hindwing.

The above three forms are fairly constant, only a few specimens out of a large series were found to be intermediate.

308. *Curetis discalis*, Moore.—Taken commonly at the foot of the hills from April to July; also a single specimen at 5,000 ft. in August.

Sub-Family—PORITIANÆ.

309. *Foritia geta*, Fawcett.—Four males taken in September and two in October near Kohima at about 4,000 ft. My native collector also sent me three females from Manipur.

Sub-Family—ARHOPALINÆ.

310. *Surendra quercetorum*, Moore.—Not uncommon; taken at the foot of the hills and at Kohima from April to August.

311. *Arhopala pirthous*, Moore.—A male at 1,700 ft. in November and another at Nichuguard in February.

312. *Arhopala cenea*, Hewitson.—A single specimen at Nichuguard in February.

313. *Arhopala agaba*, Hewitson.—A male taken in July and another in September at 5,000 ft.

314. *Arhopala bazaloides*, Hewitson.—Two females taken at Kohima in October and November.

315. *Arhopala singla*, de N.—Common; a couple of males taken at the foot of the hills in April and many specimens of both sexes at Kohima in January and February and also from July to November. Many specimens obtained were deep blackish purple and these I at first believed to be *A. bazalus*, Hewitson, but on shewing them to Mr. Bethune-Baker he identified both forms for me as *A. singla*.

316. *Arhopala fulgida*, Hewitson.—Six specimens taken at Gaspani in July and November.

317. *Arhopala arbegal*, Doherty.—Two specimens identified by Colonel Swinhoe as belonging to this species were taken in Gaspani in November.

318. *Arhopala diardi*, Hewitson.—Taken by Doherty in the Naga Hills. I have received it from the adjacent State of Manipur where it is not uncommon.

319. *Arhopala hellenore*, Doherty.—Males taken commonly in my garden at Kohima from June to August and two females at 1,700 ft. in February and November. Both sexes seem to be very common in Manipur.

320. *Arhopala paramata*, de N.—Two males taken in February and June at Gaspani and Nichuguard.

321. *Arhopala perimuta*, Moore.—A female taken at Gaspani in April.

Sub-family—THECLINÆ.

322. *Zephyrus duma*, Hewitson.—A couple of worn males taken above Kohima at 7,000 ft. in September.

323. *Zephyrus* sp. ? A single female of a form very near to *Z. syla* taken at Kirbari in the Zulla valley, 6,000 ft., in November.

324. *Ilerda epicles*, Godart.—Common at Gaspani in October and at the foot of the hills in June and July, a single male also taken in February.

325. *Ilerda kohimensis*, n. sp., Pl. ii., fig. 3. Male. *Upperside*: forewing, costa narrowly apex and termen broadly blackish brown, the remainder of the wing dull purple, this colour filling the cell and basal third of inter-space 6 and reaching the dorsum; hindwing, costa and termen broadly blackish brown, the remainder of the wing dull purple, three red lunules on the black terminal margin near the tornus, the upper one small and sometimes wanting.

Underside: forewing ochreous yellow, termen with a red marginal band commencing narrowly just below the apex and widening gradually as far as vein 2 and then continued to the tornal angle by a black streak bordered on both sides with white, another white streak above it on the inner margin of the red terminal band in interspace 2; a post discal series of blackish streaks in interspaces 1, 2, 3, 4, 5 and 6 very faint and sometimes wanting in the upper three; hindwing, ochreous yellow with a red terminal band powdered with white scales and bordered inwardly with white lunules with dusky edges and outwardly by a white line followed by a black thread both interrupted by the veins, the inner edge of this white line is bordered with a row of black triangular spots; a black spot in interspace 7 near the apex, one in the cell and another below it in interspace 1 and also one near the tornal angle; three post-discal white spots in interspaces 2, 4 and 5 the lower one the largest.

Cilia, black with a little white between the veins.

Antennæ, black ringed with white.

Female: *Upperside* blackish brown; forewing with a large post discal orange spot; hindwing with a terminal series of red lunules reaching the apex. *Underside*: as in male but somewhat paler and duller; hindwing without the subapical black spot.

Expanse 1.24 inches.

The male differs from *I. epicles* in having on the upperside the purple coloration more extended, covering nearly the whole of both wings, and of a duller shade; on the underside the yellow is purer. The female only differs on the upperside in having the red discal patch larger but as I secured only a single specimen of this sex this may not be constant; on the underside it is paler and duller. Mr. Bethune-Baker who kindly examined the genitalia for me writes:—

"I do not think they are the same (i.e., *I. epicles* and *I. kohimensis*). The *harpagines* (clasps) are practically similar but the other parts have distinct differences. The *tegumen* of yours has its lateral lobes quite twice as broad and they are somewhat curved and have conspicuous tubercles from which the hairs arise; whilst the *falces* (hooks) are angled about the middle; in *epicles* the *hooks* are narrow and straight and the *tubercles* quite inconspicuous, whilst the *falces* are evenly curved exactly like a sickle. In yours the *ædæagus* (penis sheath) is much longer and much more slender than in *epicles*; and again the *cingula* (girdle) is inclined strongly forward whilst in *epicles* it is nearly erect."

Fifteen males and one female were captured at 5,000—7,000 ft. from September to December. It is not nearly so common as *I. epicles* and flies at a much higher altitude.

I was at first inclined to think that this might only be a well marked local race of *I. epicles* but the differences in the genitalia point to it being quite distinct from that species.

326. ***Ilerda androcles***, *Doubleday* and *Hewitson*.—Taken commonly at 4,600—7,000 ft. from August to November. This is the commonest *Ilerda* in these hills.

327. ***Ilerda viridipunctata***, *de N.*—Race *kala*, n. Pl. ii., fig. 4. Under the above name I separate the form of *I. viridipunctata* found in these hills from the typical form found in Sikhim and the N.-W. Himalayas. On the upperside it differs in having the green powdery patch, which is so conspicuous in the typical form, reduced to a mere sprinkling of scales, hardly discernable in some specimens, giving the insect a very black appearance; these scales are also greener than in the typical form.

Mr. Elwes records it as being common in the Naga Hills at 6,000 ft. and above. I only obtained it in November at 5,000—6,000 ft. when it was rare owing probably to the lateness of the season.

328. ***Ilerda brahma***, *Moore*.—Very common at 5,000—7,000 ft. from August to November; a few specimens which are somewhat smaller were taken in March at 4,000 ft.

Aberration *hybrida*, n.

Very similar to typical *I. brahma* but differs in the colour being brassy green and the terminal red band on the hindwing narrower.

I have placed this form as an aberration of *I. brahma* but it may be a hybrid or even a distinct species. In colouring it is intermediate between *I. androcles* and *I. brahma*. I obtained two specimens, one taken by myself at 4,400 ft. and another taken by my collector at 7,000 ft. In the de Niceville collection, now in the Calcutta Museum, there is a specimen of this form, placed amongst *Ilerda viridipunctata* which may be one of the two sports or hybrids referred to by him in his "Butterflies of India, vol. iii, p. 339" and which he thinks may possibly be a hybrid of *I. brahma* and *I. viridipunctata*; if this form is a hybrid at all it is more likely to be one of *I. brahma* and *I. androcles* as the extent of the coloring and the character of the scales agrees with these two species whereas in *I. viridipunctata* the colour is restricted and the scales have a powdery appearance, and these characters would to a certain extent be indicated in the hybrid while they are not in the present form.

329. **Camena ctesia**, *Hewitson*.—Common at 5,000 ft. from July to December, two males also taken, at the foot of the hills in May and July.

330. **Tajuria maculatus**, *Hewitson*.—A single male taken at Gaspani in March.

331. **Tajuria illurjis**, *Hewitson*.—A single male at 5,000 ft. in September.

332. **Aphnæus syama**, *Horsfield*.—Very common at the foot of the hills. Rainy season forms taken from August to November and dry season forms in November and March.

333. **Aphnæus lohita**, *Horsfield*.—Common at Kohima and up to 7,000 ft. from June to October; also a few specimens obtained at the foot of the hills from February to July.

334. **Aphnæus khurdanus**, *Moore*.—I do not know if I have identified this insect correctly; the male is like *A. ictis* but without any orange spot. The female is a good deal larger than the male and has a Y shaped red post discal patch and has the basal area of the forewing speckled with bluish grey; these scales also appearing sparsely on the dorsal half of the hindwing, being most numerous near the tornal angle.

335. **Aphnaeus sp.** Pl. ii., fig. 5.—Four males of an *Aphnaeus* were taken between 4,000 ft and 6,000 ft. in September and October which do not quite agree with any form in the "Butterflies of India." The underside agrees with the description of *A. suni* but the upperside has no red discal spot. Mr. Elwes in P. Z. S. 1892, p. 638, describes and on pl. 43 (6) figures a female *Aphnaeus* from the Karen Hills which agrees with my males on the underside and in the coloring of the anal lobe on the upperside, and appears to be the female of this form. I showed it to Colonel Swinhoe who pronounced it to be *A. peguanus*, *Moore*; de Niceville seems to think *A. peguanus*=*A. syama* and is the dry season form of it.

Whatever the present form is, it certainly is not the dry season form

of *A. syama* which I took commonly and from which it can be at once distinguished by the deeper colour of the blue on the upperside and on the underside by the hook shaped streak in the cell. The forewing is also of a different shape and more pointed. The two insects when placed side by side look totally different.

336. *Aphnaeus rukmini*, *de N.*—A single male taken at the foot of the hills in April.

337. *Hypolyæcna erylus*, *Godart.*—Males very common at the foot of the hills from March to November. Females rather rare.

338. *Chliaria othona*, *Hewitson.*—Three males obtained at the foot of the hills from March to August.

339. *Chliaria kina*, *Hewitson.*—Three males taken at Kohima in October, also four males and two females bred from larvæ. I give the transformations from larva to imago.

At Kohima on 25th September 1909 an orchid, *Vanda cærulea*, was brought to me. On it feeding on the flowers were seven larvæ. On 27th and 28th four larvæ left the flowers and descended to the leaves of the orchid where they lay quietly on the upper surface of the leaves, three on one leaf and one on another; here they lay without moving till they pupated which two did on morning of 29th, one on the evening of the same date and one on the morning of the 30th. Two more left the flowers on 30th September and 1st October and pupated on the flower stem at its base close to the leaves. The seventh died.

The positions chosen seemed to be immaterial as some had their heads downwards and some up.

Larvæ when full grown were about .64 inches in length and of the usual onisciform shape. Colour pale green with dorsal spiracular, super-spiracular and sub-spiracular reddish mauve bands, all with the exception of super-spiracular coalescing near 11th and 12th segments; the dorsal band could be distinctly seen to expand and contract with the breathing. 11th to 14th segments entirely reddish mauve. Head pale greenish yellow with black eyes and when at rest drawn in under 2nd segment. Spiracles black ringed faintly with yellowish; prolegs tinged with reddish mauve; four dark dorsal dots on 2nd segment; a gland on dorsum between 11th and 12th segments exuding a crystal liquid eagerly sought after by attendant ants; the ant tickles the larva until it exudes a drop of liquid which it immediately drinks up. The whole of the upper body covered with short dark hairs.

Whilst preparing for transformation to the pupal stage the reddish mauve colour of the larva diminishes in intensity and when the larval skin is cast off the colour of the pupa is pale green with the mauve stripes showing faintly. The pupa lies flat on the upper surface of the leaf or on the side of the raceme to which it is attached by the cremaster to a

silken pad previously spun and is held in position by a fine thread round the 5th segment attached to the leaf on both sides of the body.

The pupa which has a decided dip between the thorax and abdomen is about .43 inches in length. By degrees the colour of the pupa changes and just before the imago emerges it becomes dark-brownish green. One imago, a male, emerged on 11th October, another male on 12th, a third male and two females on 14th and a fourth male on 16th.

340. *Zeltus etolus*, *Fabr.*—Very common at the foot of the hills up to 1,700 ft. from March to November; females rather rare, only three being obtained.

341. *Cheritrella truncipennis*, *de N.*—A single male taken on a peach tree in my garden at Kohima on 21st November.

342. *Cheritra freja*, *Fabricius*.—A male and two females taken at Gaspani 1,700 ft. in August and November.

243. *Ticherra acte*, *Moore*.—Two females of the dry season form taken at Nichuguard and Gaspani in February and two females of the wet season form in July and October.

344. *Catopacilma elegans*, *Druce*.—Two males taken at Gaspani in March.

345. *Loxura atymnus*, *Cramer*.—Common from the foot of the hills up to 1,700 ft., April to October.

346. *Gasada tripunctata*, *Hewitson*.—Rainy season forms taken in May and June and dry season forms in November and December.

347. *Deudorix epijarbas*, *Moore*.—Two females taken at 5,000 ft. at the end of October and the beginning of December.

348. *Rapala schistacea*, *Moore*.—Taken not uncommonly in my garden at Kohima in October and November.

349. *Rapala varuna*, *Horsfield*.—A single female taken at Nichuguard in June.

350. *Rapal buzaria*, *de N.*—I am not sure if I have identified this form correctly. It closely resembles the next form with which it flies, from which however it can be distinguished on the upperside by entirely lacking the orange spot and by the blue of the discal area, which is of a slightly different shade, not entering the cell; in all specimens of *R. nissa* taken in these hills the blue enters the cell. On the underside the transverse bands on both wings are narrower and straighter.

351. *Rapala nissa*, *Kollar*.—Very common at Kohima throughout the year. Cold weather forms taken from December to February are much smaller than the wet season forms and have a purple sheen on the underside; the orange spot on the forewing is much larger and the spot above the tail on the underside of the hindwing is very small. This eastern form of *R. nissa* differs from the N.-W. Himalayan form in being larger and having the blue colouration on upperside richer and deeper. The

colour on the underside in the wet season forms is a richer yellow brown which in the dry season forms is suffused with reddish purple.

352. *Rapala jarbas*, *Fabr.*—Rather common at Kohima and Gaspani in October and November.

353. *Rapala xenophon*, *Fabr.*—A single male taken at Nichuguard in February.

354. *Bindhara phocides*, *Fabr.*—A male was taken by Doherty. A single female was taken by my collector at 5,400 ft. in August.

355. *Virachola perse*, *Hewitson.*—A single male taken at Gaspani in October.

356. *Sinthus virgo*, *Elwes.*—Mr. Doherty obtained a female.

FAMILY—HESPERIADÆ.

Sub-family—HESPERIANÆ.

357. *Celænorrhinus pero*, *de N.*—Taken by Doherty.

358. *Celænorrhinus pulamaya*, *Moore.*—Three specimens taken at 5,000 ft. in August.

359. *Celænorrhinus aspersa*, *Leech.*—Not common, taken at 5,000—7,000 ft. in August and October.

360. *Celænorrhinus sumitra*, *Moore.*—Obtained by Doherty.

361. *Celænorrhinus leucocera*, *Kollar.*—Three specimens taken in September.

362. *Celænorrhinus maculicornis*, *El* and *Ed.*—A pair taken at Kohima, 4,000—5,000 ft.

363. *Celænorrhinus chamunda*, *Moore.*—A single male taken at 7,000 ft. in September.

364. *Celænorrhinus aurivittata*, *Moore.*—Taken by Doherty.

365. *Sarangesa dasahara*, *Moore.*—Several specimens taken at Gaspani and Nichuguard in October and November.

366. *Coladenia dan*, *Fabricius.*—A few specimens taken at Kohima in September and October and commonly at Nichuguard in the latter month.

367. *Coladenia agnioides*, *El. and Ed.*—The type was obtained by Doherty in the Naga hills; it must be very rare.

368. *Satarupa phisara*, *Moore.*—Two males at Gaspani in February and March.

369. *Tagiades khasiana*, *Moore.*—Several specimens taken at the foot of the hills in October.

370. *Tagiades menaka*, *Moore.*—Taken commonly, May to October, from the foot of the hills up to 5,000 ft.

371. *Tagiades atticus*, *Fabricius.*—Two specimens taken in July at the foot of the hills.

372. *Odontoptilum sura* *Moore.*—Common at the foot of the hills in

March, April and October; a single specimen also taken at 5,000 ft. in August.

373. *Astiotopterus olivascens*, Moore.—Two males taken at Kohima in August and a female at Nichuguard in July.

374. *Astiotopterus henrici*, Holland?—I am not sure if I have identified this species correctly. A single specimen taken at the foot of the hills in April agrees fairly well with Elwes' figure, T. Z. S. Vol. XIV, part 4, plate XVIII, figure 16, but has only two dots on the forewing and the apices of both wings are very much pointed.

375. *Sancus pulligo*, Mabille.—A single male taken at Nichuguard in February and both sexes taken in large numbers in October and November.

376. *Suada swerga*, de N.—Two specimens obtained at Nichuguard in March.

377. *Iambriz salsala*, Moore.—Very common at the foot of the hills in October.

378. *Ochus subvittatus*, Moore.—Very common at Kohima and at the foot of the hills from July to October.

379. *Ampittia maro*, Fabr.—A single specimen taken at Kohima in September.

380. *Aeromachus stigmata*, Moore.—Two males and a female taken at Kohima in August and many males in September.

381. *Aeromachus kali*, de N.—Five males taken at 5,000 ft., July and September.

382. *Sebastomyia dolopia*, Hewitson.—Two specimens taken in June at Nichuguard.

383. *Pedestes pandita*, de N.—Many specimens taken in August and September at Kohima.

384. *Hyarotis adrastus*, Cramer.—Taken at Nichuguard in March.

385. *Arnetta atkinsoni*, Moore.—A few specimens taken at the foot of the hills in March, May and August.

386. *Scobura cephaloides*, de N.—Taken by Doherty.

387. *Erionota thrax*, L.—A pair taken at Kohima in August and October. One of these was taken in my bungalow after dinner and evidently came in attracted by the light.

388. *Kerana diocles*, Moore.—A few specimens taken at the foot of the hills in March, July and October.

389. *Plastingia margherita*, de N.—Taken by Doherty.

339A *Pithauria stramineipennis*.—W. M. and de N.—Two specimens taken at the foot of the hills in March and October.

390. *Pithauria murdava*, Moore.—A single specimen taken at Nichuguard in June.

391. *Notocrypta feisthamelli*, Boisduval.—Common at Kohima, August to December; a single specimen taken at Gaspani in March.

392. *Notocrypta restricta*, Moore.—Common at Kohima, August to October, and at the foot of the hills in March.

393. *Udaspes folus*, Cramer.—Taken commonly at Kohima in August.

394. *Augiades siva*, Moore.—A single male taken at 5,000 ft. in September.

395. *Telicota bambusae*, Moore.—Taken commonly at the foot of the hills in February, March and July.

396. *Telicota dara*, Kollar.—Common from the foot of the hills up to 5,000 ft. throughout the year.

397. *Telicota maesoides*, Butler.—Taken commonly at Gaspani in February and March.

398. *Halpe zema*, Hewitson.—Three specimens taken in March, June and October.

399. *Halpe hyrie*, de N.—Taken by Doherty.

400. *Halpe sikhima*, Moore.—Taken by Doherty.

401. *Halpe honolea*, Hewitson.—Taken by Doherty.

402. *Halpe separata*, Moore.—Four specimens taken in August.

403. *Farnara ocea*, Hewitson.—Two males taken at the foot of the hills in February and November.

404. *Farnara sinensis*, Mabille.—Taken commonly from the foot of the hills up to 5,000 ft. in January, March and August.

405. *Farnara kumara*, Moore.—A single specimen at Gaspani in February.

406. *Farnara pagana*, de N.—A single specimen at Kohima in August.

407. *Farnara guttata*, Br. and Gr.—Taken at Kohima in August but not commonly.

408. *Farnara contigua*, Mabille.—Very common at the foot of the hills in February and March.

409. *Farnara eltola*, Hewitson.—Very common at Kohima, and the foot of the hills, March to October.

410. *Farnara bevani*, Moore.—Taken commonly from the foot of the hills up to 5,000 ft., January to October.

411. *Farnara assamensis*, W. M. and de N.—A few specimens taken at the foot of the hills in April, May and November and at 4,000—6,000 ft. in April and October.

412. *Ismene jaina*, Moore.—Several males taken at 5,000 ft. in August and September.

413. *Ismene harisa*, Moore.—Two specimens taken at the foot of the hills in March and October.

414. *Ismene vasutana*, Moore.—Common at Kohima, August to October.

415. *Ismene amara*, Moore.—A single specimen taken at Nichuguard in June

416. *Ismene gomata*, Moore.—A single specimen taken at 6,000 ft. in October.

417. *Hasora badra*, Moore.—A single specimen taken at Nichuguard in October.

418. *Hasora chabrona*, Plotz.—Taken at the foot of the hills in May and November and at Kohima in September.

419. *Hasora chromus*, Cramer.—A single male at Nichuguard in May.

420. *Hasora chuga*, Hewitson.—Taken by Doherty.

421. *Bibasis sena*, Moore.—A pair taken at Kohima in September and November and a male at Gaspani in October.

422. *Badamia exclamations*, Fabr.—Not uncommon at Kohima, August to November.

423. *Rhapalocampta benjamini*, Guerin.—Several males and a single female taken at Kohima from July to September. One of the males has the same bluish colour as in the female.

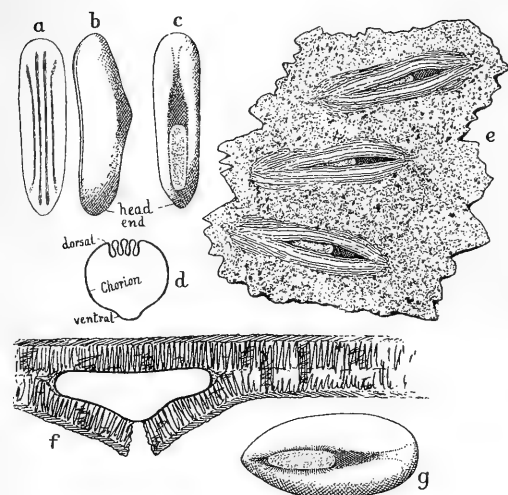


Fig. 1.

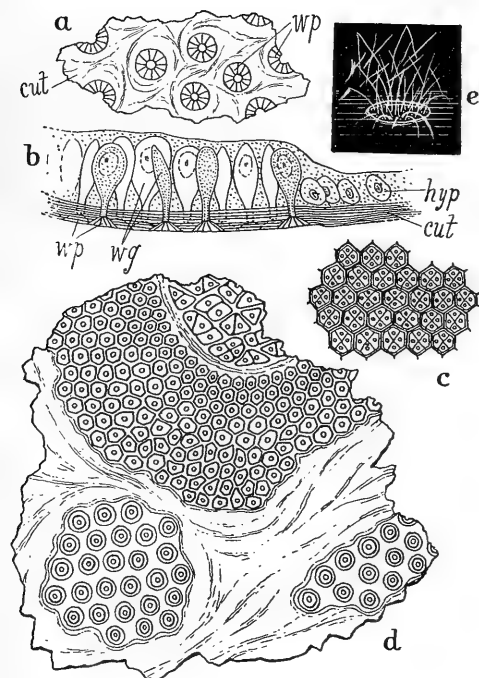


Fig. 3.

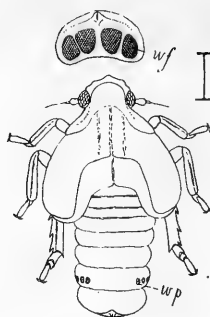


Fig. 2.



Fig. 4.

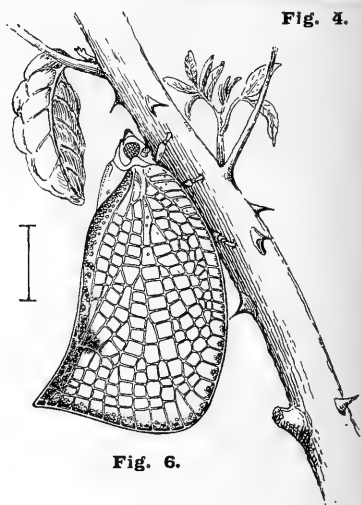


Fig. 6.

Description of Plate A:—

- FIG. 1.—a=dorsal; b=side; c=ventral view of egg of *Salurnis marginellus*, Guerin; d=transverse section of egg in ovary; e=underside of portion of leaf in which three eggs are laid; f=transverse section of egg in leaf; g=ventral view of egg, taken out of a leaf.
- FIG. 2.—Nymph of *Geisha distinctissima* after fourth moult; view of end of abdomen above: wf=wax-field; wp=wax-pit.
- FIG. 3.—a=looking on exterior of portion of cuticle of wax-field of *Nermelicharia furtiva*, Melichar: wp=wax-pit; b=section through the wax-field: wg=wax-glands; wp=wax-pits; hyp=hypodermic cells; cut=cuticle; c=looking on exterior of portion of cuticle of wax-field of *Geisha distinctissima*; d=looking on exterior of portion of cuticle of wax-fields of *Salurnis marginellus*; e=one of the dorsal wax-pits of *Geisha distinctissima*, showing wax-spicules re-forming after being wiped off.
- FIG. 4.—Nymph of *G. distinctissima* with *Dryinid* parasite under right wing-pad.
- FIG. 6.—Adult female of *Salurnis marginellus*.

(All the figures are much magnified.)

NOTES ON FLATA.

BY

J. C. KERSHAW, F.Z.S., F.E.S.

(With Plates A & B).

Three species of Poekillopteridæ or Flata are here discussed, viz.:—*Salurnis marginellus*, Guerin, and another rather larger species, *Geisha distinctissima*, Walk., both from South China; also *Neomelicharia furtiva*, Melichar, from North Queensland. Both *Geisha* and *Salurnis* feed in all instars on many plants, but their favourite foodplant is *Xanthoxylum nitidum*, D. C., N. O. Rutaceæ, an exceedingly common and very prickly half-climbing shrub. One species is also fond of the small tree *Heptapleurum octophyllum*; Hance, N. O. Araliaceæ.

The female of *Salurnis marginellus* is provided with a pair of hard, chitinous saws (s, fig. 5) with which she cuts a slit in the undersurface of a leaf, or in the bark of stems. An egg is then inserted in the slit (e, fig. 1) together with a little colleterial fluid, so that the leaf tissues adhere firmly to the chorion of the egg. No white matter or wax is deposited on the embedded egg, but a very tiny portion of which is visible through the slit in the leaf, and then only with a lens. The eggs produce very slight protuberances on the leaf surface, and are laid singly, though sometimes two or three may be found in different parts of the same leaf or stem. The length of the eggs is about 1.4 mm.

Whilst in the ovary the eggs are circular in transverse section, with four deep longitudinal invaginations of the chorion on the dorsal surface, showing on the exterior of the egg as narrow lines, and working out to nothing at head and tail (a, b, c, d, fig. 1). When the egg is laid, however, it becomes in transverse section shallow and exceedingly broad, and with the expansion of the egg these invaginations totally disappear (g, fig. 1). The portion of the chorion which forms the long, narrow lid, and faces the slit in the leaf, is of different sculpture to the rest of the egg, which is impressed by the ovarian epithelial cells with the usual more or less hexagonal reticulation. The object of this curious provi-

sion for expansion seems to be to allow the egg, after being laid in the slit in the leaf, to expand sideways into the cavity and thus take up less space in the slight thickness of the leaf: besides allowing the cut edges of the slit to close upon and protect the egg (f, fig. 1).

The nymphs are broad and flat and, except for the growth of the wings, very similar in all instars; they are chiefly of a dull white. Their powers of jumping are highly-developed and they can spring great distances, even when recently hatched. The nymphs usually feed on the underside of fresh leaves, or on the stems of new shoots. Those of both *Geisha* and *Salurnis* emit a white, waxy material in great quantity; but whilst the nymph of the larger species lives almost covered by the white, flocculent material, the nymph of *S. marginellus* extrudes most of the matter in two long streamers from the anal segment. Some of this white substance instantly dissolves in spirit and melts with heat, and is of a waxy nature, but a large part consists of hollow filaments or hairs, much broken and interlaced, insoluble in either spirit or potash; apparently much resembling in chemical nature the wax-hairs which project from the anal segments of certain leaf-hopper nymphs.

In the nymph of *Geisha* there are ten small circular wax-pits or fields (wp, fig. 2), five on either side of the seventh abdominal segment, showing yellowish when the wax is removed. Only three of these wax-pits appear on each side in fig. 2, the others being below but in the same line. If, whilst the nymph is living, the wax is brushed away from these pits, the wax-spicules are seen forming again immediately, and enough is soon emitted to again more or less cover the insect (f, fig. 3). But there are much larger wax-fields on the end of the abdomen in both species, as shown at w. f. fig. 2., which represents a nymph of *Geisha* after the fourth moult. The cuticle of these wax-pits and fields is curiously fretted and pierced for the innumerable tiny unicellular wax-glands (fig. 3). These glands are modified and enlarged hypodermis cells; secreting the wax through the fretted areas of the cuticle (a and b fig. 3, from nymph of Australian species). In some species of *Flata* this fretting is rather rough and simple; in some it is highly ornate and intricate: most species have at least

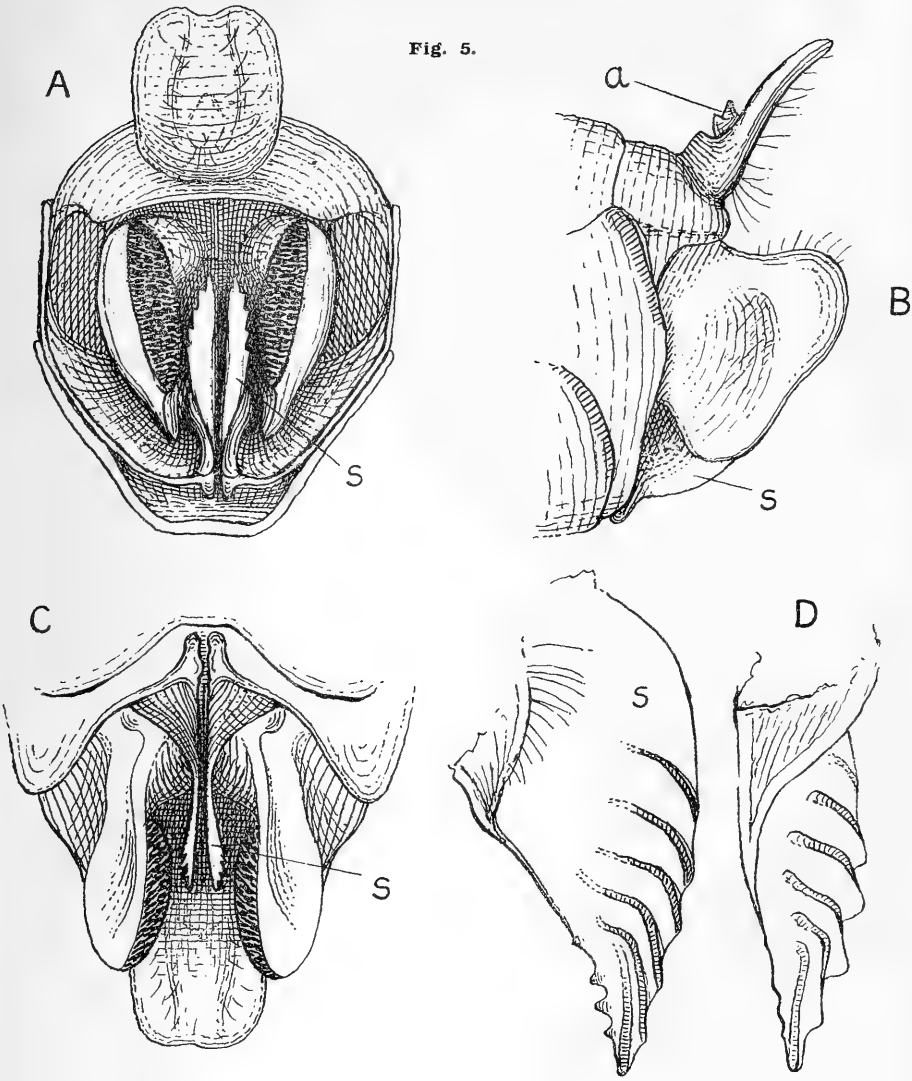


Fig. 5.

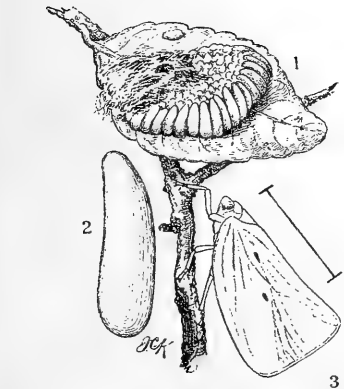


Fig. 7.

Description of Plate B :—

FIG. 5.—A=end view of end of abdomen of *Salurnis marginellus*.

B=side view.

C=view from underside.

D=two views of the “saws.”

a=anus.

s=saw.

FIG. 7.—*Neomelicharia furtiva*.

1=Egg-batch on leaf.

2=Egg.

3=Adult female.

(All the figures are much magnified.)

two different patterns of fretting on the same individual, and even on the same wax-field, as shown at e, fig. 3; and again the frettings on the cuticle of the anal areas differ from that of the wax-pits on the dorsal segments (c and d, fig. 3). The glands themselves, however, all appear to be of the same type, though differing much in size. The wax-glands of the Chinese Candlefly, (*Pyrops candelaria*), a large *Fulgorid*, are very similar to these *Flatid* glands. It will be seen from fig. 3 that each little pit in A and B has but one gland discharging through it; whereas in C and D each area has four openings for glands, which, however in this instance, are much smaller; they are, moreover, practically divided off from one another, as shown.

The nymphs of *Geisha* and *Salurnis*, which may happen to be hatched late in the Autumn, rest during the dry season, feeding but little; and often creep for shelter from cold between leaves secured together by spiders, ants or lepidopterous larvæ. These nymphs moult to adults at the beginning of the wet season. The *Flatas* are nocturnal, usually remaining motionless on a leaf or stem during the day, but becoming active and flying about at dusk and during the night, when they couple and oviposit. These two species of *Geisha* and *Salurnis* are, as a rule, solitary, though several may sometimes be found on the same bush. The nymphs of the larger species are much infested by a *Dryinid* parasite, which appears as a black, circular, flat sac beneath one of the wing-pads (fig. 4); but it is not uncommon in South China to find a parasite under each wing-pad.

The Australian species of *Flata* here mentioned—*Neomelicharia furtiva*—is gregarious, and has the common *Flatid* habit of many individuals sitting in line close together along a twig or branch. This species oviposits in quite a different manner from *Salurnis marginellus*, since it lays its eggs in a large batch on the surface of leaves, often on the upperside, and the batches are usually thickly covered with the white waxy matter. The female is not provided like *Salurnis* with "saws" for cutting leaf tissues. This *Flata* is a pest on orange and lemon trees in Queensland, which are often loaded with the insect in all instars during the wet season.

THE OOTHECA OF AN ASILID.

BY

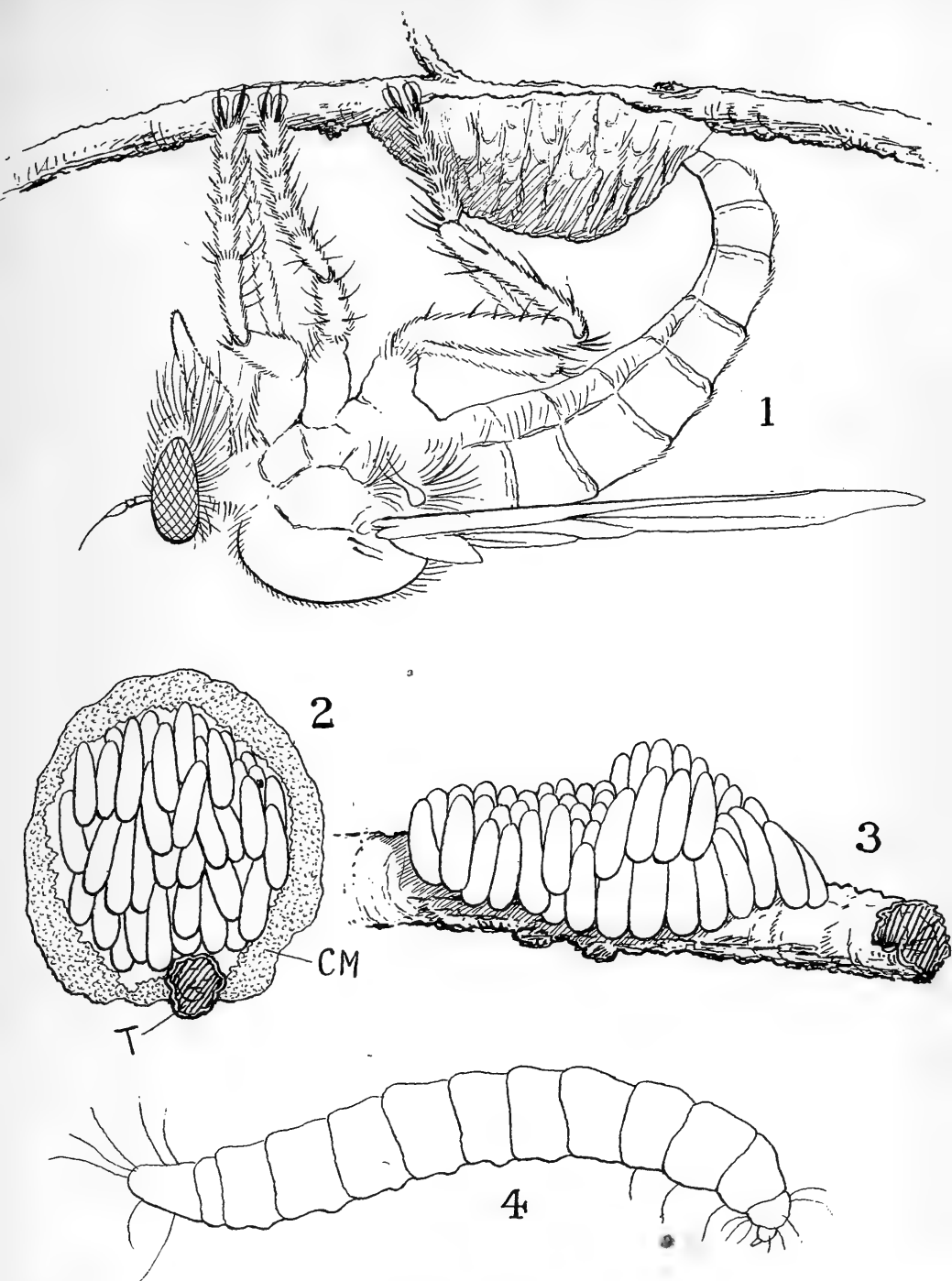
J. C. KERSHAW, F.Z.S., F.E.S.

(With Plates A and B).

The ootheca of this *Asilid** (*Promachus*, sp.), which is very common in Kwangtung Province, S. China, is affixed to the upper end of long, coarse grass-stalks, the bare ends of twigs of woody herbs and such-like situations, usually two or three feet above the ground. Where the flies are numerous—along hedge-rows on the outskirts of woods and patches of vegetation—these egg-cases may be found in dozens during May and June, the flies constructing them having emerged about the end of April. The male is easily distinguished from the female (even on the wing) by the patch of pure white hairs on the dorsal surface of the end of the abdomen; the total length of the fly is about one inch, and the ♀ is usually the larger. When about to couple—the ♀ generally sitting quietly on a leaf or twig—the ♂ hovers for a few moments like a *Syrphid*, about a foot above and a little in front of and facing the ♀. He then suddenly darts down on her, and coupling is immediately effected. They remain *in coitu* several hours, end to end, the ♀ often feeding meanwhile, as is the habit of the *Asilidæ*. There are one or two smaller species in Kwangtung, probably of the same genus, which construct similar but smaller egg-cases.

The species here noted was observed making its ootheca in the middle of May, on the underside of a stout tendril of a shrub about four feet from the ground. The insect hung on the underside of the twig and curved the tip of the abdomen (Plate A, fig. 1), emitting a whitish, waxy-looking colleterial fluid and moving the

* The fly is perhaps undescribed; it is not yet in the collection of the British Museum, to which, however, the specimens alluded to in this paper will be presented. The male has a conspicuous white tuft on the dorsum just before the genitalia; the legs are black, except the yellow tibiae. This character distinguishes the species from *P. yessonicus*. Though this is a most ordinary looking *Asilid* and appears to be very common, there is nothing very near to it in the British Museum collection.—D. SHARP.



THE OOTHECA OF AN ASILID
(much enlarged).

FIG. 1.—♀ constructing ootheca, which is nearly finished.

FIG. 2.—Transverse section of ootheca. **CM** = colleterial matter, forming outer covering.
T = twig on which ootheca is built.

FIG. 3.—Side view of eggs, the outer covering having been mostly dissolved away with benzine.

FIG. 4.—Larva just hatched.

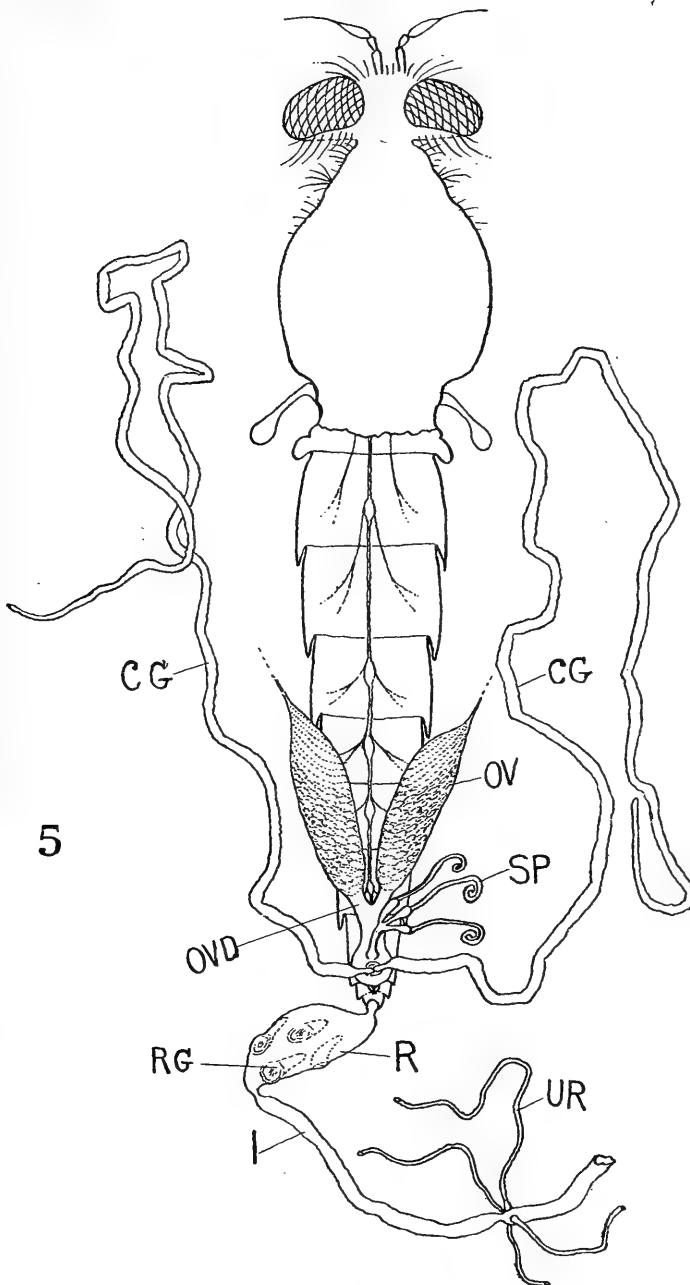


abdomen-tip round and round the circumference of the ootheca now and then stopping this movement to prod over the surface except around the edge—when it was probably ovipositing, but the abdomen-tip, as in the case of a *Mantis* forming its ootheca, was concealed by the colleterial matter. In plan the ootheca is roughly a pointed oval, in transverse section roughly circular, and the pointed end is the part of the ootheca first formed; the large end, which is more or less flat, is finished off by the insect working the abdomen-tip around the ootheca from the circumference gradually to the centre, where the colleterial matter is broken off, leaving a small knob or protuberance. About an hour after its construction, the egg-case is firm on the exterior and, although more or less moulded and wrinkled where the eggs happen to be near the surface, is smooth and of a waxy-white with a slight gloss. The egg-case occupied the insect about an hour in the making, and it then flew away. The ootheca of this species varies much in size according to the number of eggs contained: this particular example was three-eighths of an inch long and three-sixteenths broad and deep at its greatest girth and depth. The eggs are usually laid in two tiers, but with fewer in the upper tier (*lower* tier in the natural position of the ootheca), as shown in Plate A, Figs. 1, 2 and 3. They are slightly cemented together and to the twig by the natural secretion of the ovaries. Outside the eggs, and covering them entirely, is the thick wall of colleterial matter (Fig. 2, C.M.); the eggs are excluded whilst a supply of colleterial matter is kept up over the exterior eggs, so that they are not visible whilst being deposited. They are laid in rather an irregular manner, as may be seen in Fig. 3, where the outer covering has been partly dissolved away with benzine, exposing the eggs. The outer covering is not hard and horny chitinous matter like the egg-cases of some species of *Mantis*, but is moderately firm and microscopically porous, owing to included air-bubbles, somewhat like the spongy outer wall of some of the less specialised *Mantis* oothecæ. These *Asilid* egg-cases, however, often resist the weather for several months after the larvæ have hatched out.

The colleterial glands of the ♀ are two long colourless tubes,

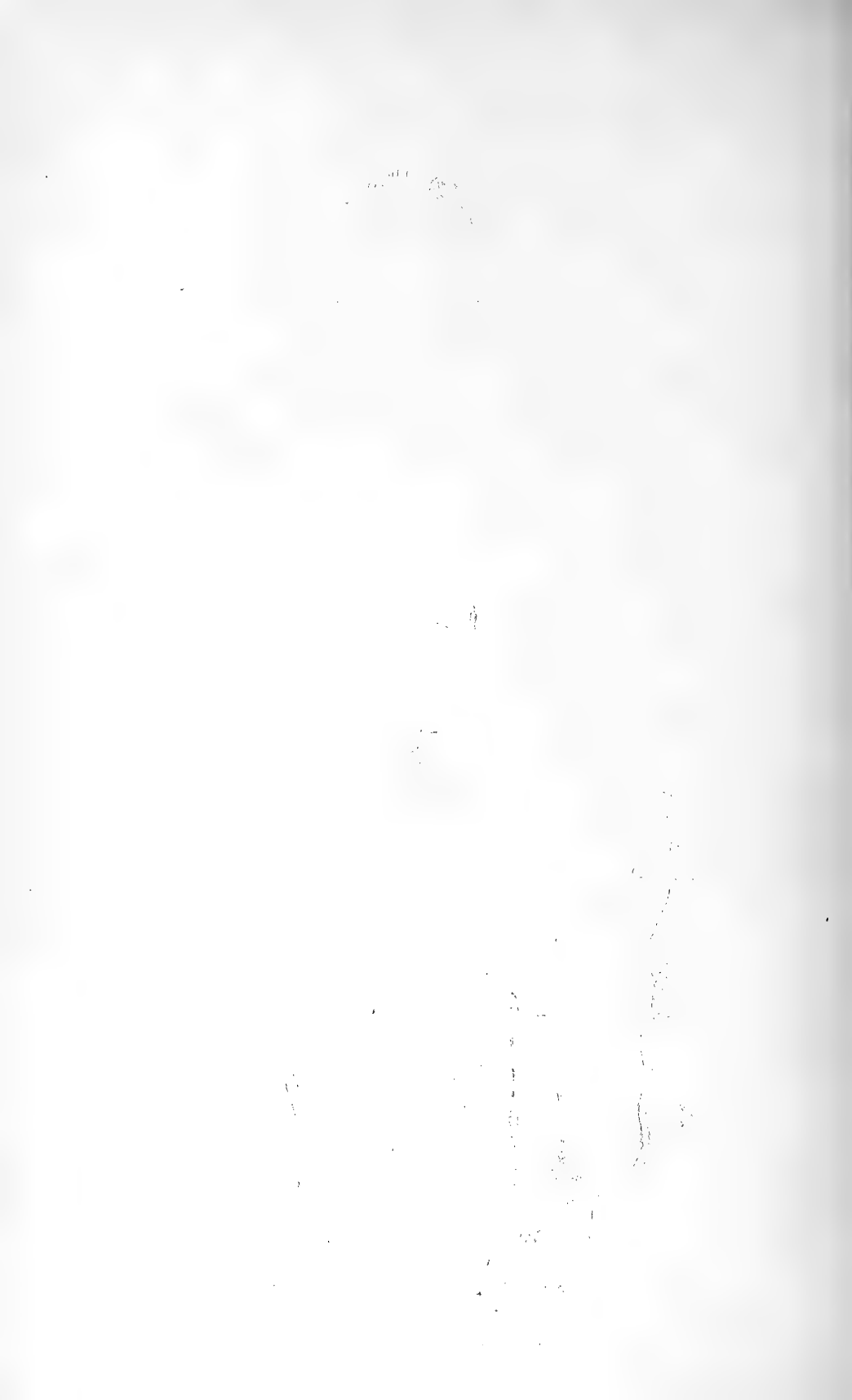
about four times the length of the abdomen, of very even diameter except just at the distal ends, where they taper and end blindly. They open separately but close together into the dorsal wall of the vagina, just behind the spermatheca. The glands pass upwards over the oviducts and forwards to the anterior segments of the abdomen, coiled up and lying on each side of the intestines. When the insect is about to oviposit the glands are of a pale yellow. The ovaries (ov, Fig. 5) shown in the figure are small, the eggs in this specimen not being matured. In their natural position the three curved ends of the spermatheca (SP) are bunched up together. The distal ends are purplish or reddish. There are four rectal glands (RG) like the finger-tips of a glove, which project into the interior of the rectum (R), the tips pointing towards the anus. Tracheal branches from the stigmata are attached to the bases of the glands, and capillaries penetrate to the tips thereof. These tracheæ partly serve to retain the rectum in position. There are four long urinary tubes (UR). The colleterial matter taken from the glands of a freshly-killed fly ready to oviposit, is pale yellow and viscid. Spread on a slip it dissolves entirely in 10 per cent. potash; on the potash evaporating the matter is re-deposited as a semi-opaque film, which easily disintegrates. The fresh material spread on a slip soon dries as a pale yellow translucent film, hard and brittle. After exposure to the air, it is much less easily soluble in potash. Probably the whitish appearance of the completed ootheca and its greater resistance to solvents is due to its aërated or porous condition, since the action of the atmosphere certainly causes some chemical change in the colleterial matter.

The eggs are smooth, whitish and shiny; the number in the ootheca was not counted, but it was certainly over fifty. They hatch in six or seven days, and most of the larvæ emerge simultaneously in a regular rush, though stragglers keep on emerging for two or three hours. They immediately drop to the ground and commence burrowing into it, or descend by the numerous crannies and fissures. The newly-hatched larva (Fig. 4) is smooth, whitish and shiny, with a few hairs on the anterior and posterior segments. I was unable to rear the larvæ, but they probably feed on subterranean coleopterous larvæ.



THE OOTHECA OF AN ASILID
(much enlarged)

FIG. 5.—Abdomen of ♀ opened dorsally, showing colleterial glands, &c. CG=colleterial glands. OV=ovaries. OVD=oviducts. SP=spermatheca. UR=urinary tubes. R=rectum. RG=rectal glands. I=ileum.



EXPLANATION OF FIGURES.

Fig. 1

♀ constructing ootheca, which is nearly finished.

Fig. 2.

Transverse section of ootheca. CM = colleterial matter, forming outer covering. T = twig on which ootheca is built.

Fig. 3.

Side view of eggs, the outer covering having been mostly dissolved away with benzine.

Fig. 4.

Larva just hatched.

Fig. 5

Abdomen of ♀ opened dorsally, showing colleterial glands, etc. CG = colleterial glands. OV = ovaries. OVD = oviducts. SP = spermatheca. UR = urinary tubes. R = rectum. RG = rectal glands. I = ileum.

All the figures are much enlarged.

RAMBLING NOTES ON NATURAL HISTORY IN CHITRAL.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

During my year's residence in Chitral I had considerable leisure to devote to natural history objects. In the main my attention was devoted to butterflies, but in their pursuit I had opportunities of observing many other objects, and the following excerpts from my note books may be of interest to others who may be garrisoned there in years to come.

MAMMALIA.

JACKAL (*Canis aureus*), Linnè.—I was asked by Mr. Kinnear to try and get specimens of this among other Mammals, but when I came to question the officers who went out after big game, I found no single one had ever heard it. Mr. Keppel made enquiries for me among the Chitralis, and was told that jackals are known in the Valley in which Arandu is situated, but do not come up as far north as Mirkani. It would seem then that they only just enter the south of Chitral Territory, and it is probable the Lowarai Pass is their proximate Northern barrier.

WHITEHEAD'S STOAT (*Mustela whiteheadi**), Wroughton.—Under the misnomer *Putorius erminea* I referred in a previous Journal (Vol. XX, p. 514) to a specimen of this little known animal killed in Chitral.

COMMON OTTER (*Lutra vulgaris*), Erxleben.—Our British Otter is not uncommon. I saw the skins of 3 or 4 specimens, one quite freshly stuffed in the usual Chitrali method with grass. Its grizzled coat, and the angular posterior edge of the rhinorium I presume leave no doubt in diagnosis.

THE SMALLER KASHMIR FLYING-SQUIRREL (*Sciuropterus fimbriatus*), Gray.—Three or four skins of this flying squirrel were brought to me. The Chitralis said they were not uncommon and lived chiefly in walnut and apricot trees. They also said that they nest in holes in trees. They call it "jungli khalao," or "wild rat."

BLACK RAT (*Mus rattus*), Linnè.—The common rat in Chitral in and about buildings is this species.

PERSIAN HOUSE-MOUSE (*Mus bactrianus*), Blyth.—The Persian mouse is the species inhabiting the Fort at Drosh. I caught several, but no other species.

* Described in this Journal, Vol. XVIII, p. 882.

AFGHAN HARE (*Lepus tibetanus*), Waterhouse.—Hares were not very plentiful, but a few came to bag on our day's out chikor shooting. The species is the Afghan hare.

OORIAL (*Ovis vignei*), Blyth.—The Oorial is common. The best heads entered in the game book in the Drosh Mess are as follows :—

Year.	Length.	Sportsman.
1900-01	30"	Major Leslie, R.E.
"	32"	Lieut. Rice.
1902-03	31"	" Money.
1905-06	30 $\frac{1}{4}$ "	" Robertson-Glasgow.
"	32 $\frac{1}{8}$ "	Captain Knollys.

HIMALAYAN IBEX (*Capra sibirica*), Meyer.—The following are the best heads that Chitral has furnished of the Ibex :—

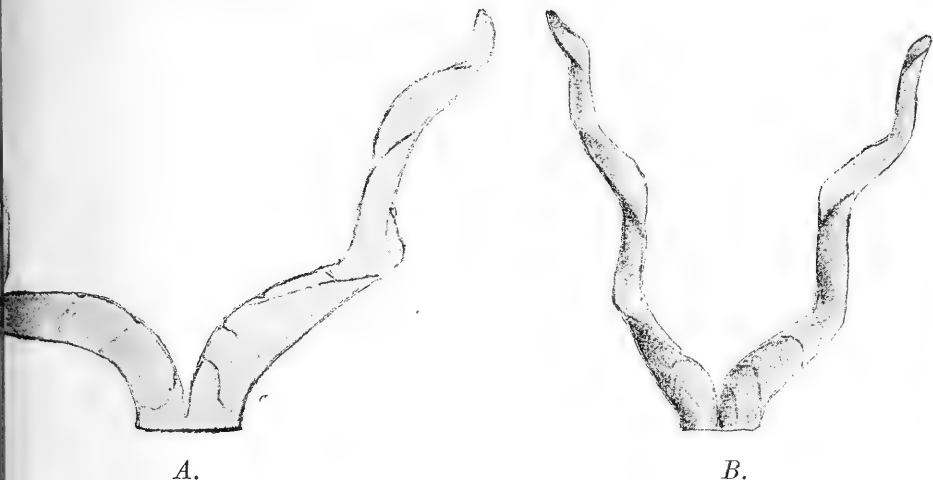
Year.	Length.	Sportsman.
1903-04	46 $\frac{3}{4}$ "	Major the Hon'ble Bruce.
1907-08	46 $\frac{3}{4}$ "	Captain Nicolay.
"	45"	Picked up.
1909-10	47 $\frac{1}{4}$ "	Lieut. A. G. Stone.
"	45 $\frac{1}{2}$ "	" A. G. Stone.
"	45 $\frac{1}{2}$ "	" E. T. W. McCausland.
"	47"	Captain Keppel.
"	45 $\frac{1}{2}$ "	" E. T. W. McCausland.
"	47"	" Keppel.
"	47"	" Keppel.

MARKHOR (*Capra falconeri*), Hügel.—The best heads entered in the game book are as follows:—

Year.	Length.	Sportsman.
1898-99	56"	Captain Rose.
1899-00	50 $\frac{1}{2}$ "	" Cooper.
"	52 $\frac{3}{4}$ "	" Gurdon.
1900-01	51"	Lieut. Rice.
"	57 $\frac{1}{2}$ "	Picked up.
1901-02	51 $\frac{1}{4}$ "	Major Leslie.
"	50 $\frac{1}{4}$ "	Captain Bradly.
"	55 $\frac{3}{4}$ "	Picked up.
1902-03	50"	Captain Kennion.
1904-05	50 $\frac{1}{4}$ "	Lieut. Young.
1906-07	52"	" Burton.
"	51 $\frac{3}{4}$ "	" Carruthers.
1907-08	51"	" Toppin.
"	50"	Captain Nicolay.
1909-10	50"	Lieut. Pemberton.
"	52 $\frac{1}{2}$ "	Captain Lyall.

The usual variety of horn is the Pir Panjal. The head secured by Captain Rose in 1898 (Figure B) seems to me as near to the Cabul variety as the Pir Panjal. More than one head (as seen by photographs) has been shot with the horns very dissimilar. Figure A shows one shot by Lieut.

Rice in 1900-01, in which the right horn is of the Astor type while the left is of the Pir Panjal type.



A.

B.

Capra falconeri.

AVES.

In Volume XIX, p. 901, of this Journal, Captain Perreau gave a list with notes of the birds of Chitral. I am able to add a few species to this list which I have marked with an asterisk.

THE GREENISH WILLOW-WARBLER* (*Acanthopneuste viridanus*), Blyth.—I found this among the bag made by two urchins with stonebows. The measurements were: Length 4.5", wing 2.3", tail 1.6", gape .48" and tarsus .75".

CENTRAL-ASIAN STARLING (*Sturnus porphyronotus*), Sharpe.—Captain Perreau was in doubt as to the species of starling he saw in Drosh. I saw many flights in early November, and on the 5th shot two which I identified as this species, and a skin sent to our Society was acknowledged as such. I saw flights of starlings again late in February flying North, but halting in Drosh.

PARADISE FLYCATCHER (*Terpsiphone paradisi*), Linnè.—I saw a single specimen in black and white plumage in Drosh on the 24th April.

COMMON PIED BUSH-CHAT (*Pratincola caprata*), Linnè.—I noted this common in April on the farm in Lower Drosh.

THE INDIAN BUSH-CHAT (*Pratincola maura*), Pallas.—I saw a few pairs on the farm in Lower Drosh in March.

REDWINGS (**Turdus iliacus*), Linnè.—Captain Perreau says he is nearly sure he saw this bird near Drosh in February. I saw many on the farm at Drosh in February and March and shot one on the 23rd of March to make the point certain.

BROWN DIPPER (*Cinclus asiaticus*), Swains.—Captain Lyall told me he found a nest of the dipper on the 2nd of February in Kesu Nullah.

HOUSE SPARROW (*Passer domesticus*), Linnè.—This species forsook us for the winter, leaving only the tree sparrow (*P. montana*) as abundant as in the summer. I noticed the common sparrow back again in the Fort in early April.

PINE BUNTING (*Emberiza leucocephala*), Gmelin.—I found several nests about Madaglasht (10 to 11,000 feet) in June and July.

CRAIG-MARTIN (*Ptyonoprogne rupestris*), Scopoli.—The first I saw were flying about in all directions on the 27th of March. The last were observed flying North in large numbers even till well after dusk on the 16th of May.

SAND-MARTIN (*Cotile riparia*), Linnè.—I noted several hawking about the river near Kesu on the 1st of May.

EUROPEAN HOOPOE (*Upupa epops*), Linnè.—I saw these species in the summer up to fully 12,000 feet, and it was breeding well up to 11,000 feet.

CUCKOO (*Cuculus canorus*), Linnè.—I heard the cuckoo first on the 8th of May. I chased a company of at least six on my pony all flying south on the evening of the 16th of May. Each separately fluttered out of the wayside trees and hedgerows, to perch a hundred yards or so further on, and repeat the flight as I passed by.

HIMALAYAN GRIFFON (*Gyps himalayensis* ?), Hume.—A large vulture is fairly common in Chitral which I suspect is the above species. It is in flight just like a large edition of the next species, but is much too large to have been confused with that species. I saw it in the winter about Drosh always flying very high. In the summer above Madaglasht I saw them many times, and on more than one occasion congregated on the carcasses of goats, etc.

EGYPTIAN VULTURE (*Neophron percnopterus*), Linnè.—Captain Perreau mentions this in the summer, but I saw it not infrequently in the winter.

MERLIN (*Æsalon regulus*), Pallas.—Among the Mehtar's hawks I saw a specimen of this hawk in very fine plumage. The attendant informed me it had been reared in the country.

LARGE EGRET (*Herodias alba*), Linnè.—Captain Lyall sent me a skin. He bagged one of three seen on the 1st of May.

GREY LAG GOOSE (*Anser ferus*), Schœff.—I do not think I could have been mistaken in the identification of this goose, though none was brought to bag. Geese were frequently heard at night fighting by, and I several times saw flocks that I took to be this species. In Malakand years ago at about the same time of year I remember more than one being shot.

BRAHMINY DUCK (**Casarca rutila*), Pallas.—I saw three Brahminy duck flying north on the 17th April, and a large flight containing over 70 on the 25th. I saw one or two settled on the banks of the river at Drosh.

GADWALL (**Chaulelasmus streperus*), Linnè.—A few shot in March.

RED-CRESTED POCHARD (**Netta rufina*), Pallas.—Many seen, and a few shot in March.

POCHARD (**Nyroca ferina*), Linnè.—I shot one on the 27th March.

WHITE-EYED DUCK (**Nyroca ferruginea*), Sharpe and Dresser.—A few shot in February and March going north.

SMEW (**Mergus albellus*), Linnè.—A party of four were seen after the very severe snowstorm in January. Three of these were brought to bag on the 29th of January.

REPTILIA.

The reptiles of Chitral formed the subject of a separate paper which has already appeared in this Journal.*

PISCES.

Oreinus richardsoni.—I sent home specimens of the fish called by every one "Snow trout" to Mr. Boulenger. It appears that these are not trout at all but a species of a different genus.

ANNELIDA.

Gordius zorattarii (Camerano).—On the 28th of March in very cold weather a specimen of this wire worm was found in the mule trough in Lower Drosh. The Chitralis firmly believe that it falls with the rain. I heard of others being found in the snow about the time when rain was falling. I sent this to Professor Camerano at Turin who identified it, and told me little or nothing is known of its habits. The type was found near Darjeeling. I have had specimens sent me from Shillong in the Khasi Hills, Assam, from Dibrugarh in Upper Assam, and found a specimen myself this year in my compound at Almora on the 2nd of January on a very cold day whilst sleet was falling. This last, the largest I have seen, measured $19\frac{1}{2}$ inches, and was the calibre of a fiddle string.

LEPIDOPTERA.

Papers have already appeared in our Journal on the butterflies of Chitral contributed by Captain W. H. Evans, R. E.†

To the species referred to in these papers I can add three, the identification of which has been confirmed by Captain W. H. Evans.

Argynnis pales.—I found this fairly common at about 13,000 feet on slopes above Madaglasht, at the end of July and beginning of August, in company with *A. jerdoni* var. *chitralensis*. On the last day of July on the Doki Pass at about 14,000 feet where species were very limited, I

* Vol. XXI, page 132.

† Vol. XIV, p. 666 and Vol. XX, p. 423.

came across this in great numbers on a steep stony shale slope. I captured about sixty in a couple of hours, on an otherwise uneventful day.

Lycaena jaloka.—This species was very abundant on a small patch of stony ground in July above Madaglasht at about 12,000 feet. The females were less numerous than the males. It was extremely local and confined to about an acre, and I never saw another specimen, except a solitary one at the foot of the Doki Pass at about the same altitude on the 31st July.

Pieris kreuperi, race *desta*.—Of this species I obtained but half a dozen specimens in June in the Lutkoh valley at about 6,000 feet elevation.

PSYCHODIDÆ.

Phlebotomus pappatasi and *P. babu*.—I collected sand-flies in the Fort at Drosh, and submitted them to Dr. Annandale for identification. Two species were found prevalent, and one or both are believed to be the transmitting agents of that disagreeable fever so common in Chitral which is variously known as Drosh fever, Chitral fever, Sand-fly fever, phlebotomus fever, pappateci fever, etc., etc. They haunt the dark corners of rooms, getting behind shutters and doors, and bite freely at night.

CULICIDÆ.

Two collections of mosquitoes made by me unfortunately come to grief in the post, so it remains for another to trace the species on which we are dependent for malarial fevers in the Chitral Garrison.

FILICES.

Ferns were extremely poorly represented in species. At the level of Drosh, up to about 6,000 feet I only saw three species, though I frequently went in search of them. About Madaglasht during my excursions after butterflies I frequently went out of my way to investigate the ferns, but I do not think I ever saw more than three species.

Cystopteris fragilis (Berah).—A fern which I took to be the bladder fern was quite common about Madaglasht (10,000 feet and over).

Cheilanthes szoritzi (Fisch and Meyer).—A species of *Cheilanthes* was very common about Drosh which I think I am not mistaken in referring to this species.

Adiantum cappillus veneris (Linnè).—This was common everywhere, where damp enough, at low elevations.

Hemidictyum ceterach (Linnè).—The Scale fern flourishes, and is abundant about Drosh at elevations up to at least 6,000 feet.

Asplenium trichomanes (Linnè).—I found this plentiful all about Madaglasht.

Asplenium septentrionale (Linnè).—The forked Spleenwort grows abundantly in the vicinity of Madaglasht.

SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS.

BY

CAPTAIN F. E. W. VENNING.

The following short list of such birds and birds' nests as I was lucky enough to find at Haka is forwarded with the hope that it may encourage some one else to observe the very abundant bird life in that happy spot from which, to my regret, I have now been transferred. Most of the skins obtained were sent to Major H. H. Harington who took them home with him and identified them for me and my thanks are due to him for his valuable advice and encouragement to my first efforts in ornithology, and for his remarks on these notes which I have interpolated in the places where they apply, putting them in square brackets followed by the initials H. H. H.

The numerals and nomenclature are those of the "Fauna of British India."

CORVIDÆ.

CORVINÆ.

(4) THE JUNGLE CROW, *Corvus macrorhynchus*.—Called by the Chins "Ak" (like the English word "Ark") or more particularly "Klang (mountain) Ak," the monosyllable being a very good representation of the bird's call. Very common, but I found no nests. The elytra and other hard parts of dung beetles were found in the stomach of one.

(12) THE RED-BILLED BLUE MAGPIE, *Urocissa occipitalis*.—Plentiful, generally to be seen going about in families of six or eight which always attract attention by their harsh scolding. One brought alive by a Chin. No nests found. Perhaps *U. flavirostris* also occurs.

[Recorded by Col. Rippon from Mt. Victoria. There is also a skin of his from the same locality of *U. flavirostris*.—H. H. H.]

PARINÆ.

(34) GREEN-BACKED TIT, *Parus monticola*.—Very common. Two

nests of this species were found by me. The first was found on the 3rd May 1910 and was placed in a small hole just below the branch of a wild pear tree (*Pyrus pashia*). The hole was about six inches long running horizontally into the tree-trunk. The nest consisted of a thick pad of moss interwoven with fine hairs and wool. The eggs were five in number measuring from $\cdot66 \times \cdot52$ to $\cdot64 \times \cdot51$, and were pale pink with some pale brownish red blotches scattered round the larger end chiefly. The second nest was found on 7th May and brought in by a Chin, who brought the bird with it, and said he found it in a hole in the ground. The nest was composed of moss and hair (? goat's). There were five eggs, rather paler than the last with the spots more generally scattered over the whole surface. These measured from $\cdot68 \times \cdot54$ to $\cdot66 \times \cdot53$. In the former case the eggs were in an advanced state of incubation.

[Also got by Col. Rippon at Mt. Victoria. Very interesting how many of the Himalayan and Indian birds turn up in the Chin Hills and Aracan.—H. H. H.]

(36) HUME'S RED-HEADED TIT, *Aegithaliscus manipurensis*.—Fairly common, but in spite of days of careful watching I never found the nest. The tarsus measured $\cdot65$ in., not $\cdot35$ as given in the "Fauna."

[Recorded by Col. Rippon from Mt. Victoria.—H. H. H.]

CRATEROPODIDÆ.

CRATEROPODINÆ.

Babax victorie (Rippon).—One nest found by my wife on 13th April. The nest was an open cup composed of dead leaves and thick grass stems lined with fine root fibres placed about two feet above the ground between the stems of a small thorny bush at the head of a little swamp. The interior diameter of the nest was $3\frac{1}{2}$ inches with a depth of $1\frac{1}{2}$ to 2 inches. When found there was only one egg but a second was laid on 14th, after which the bird was continually on the nest till the 18th when the bird was shot and the nest taken. Eggs opaque turquoise blue $1\cdot2 \times \cdot86$ and $1\cdot19 \times \cdot83$. The bird was very difficult to see after it had once left its nest, and skulked in the thickest bushes.

[Discovered by Col. Rippon at Mt. Victoria. Description in the B. B. O. C., Vol. XV, p. 97. This is a much larger bird than *B. yunnanensis* from Bhamo. This is the first record of its nest and eggs.

N. B.—*Babax lanceolatus* was reported in the J. A. S. B., Vol. LXXI, part II, no. III/02 by Lieut. H. Wood, R. E., and F. Finn as having been got in the Chin Hills. This must be a mistake and the bird wrongly identified and it would be advisable for the Calcutta Museum to have the skin properly identified. It gives a wrong locality for *B. lanceolatus* which so far has not been recorded I believe from Indian limits—although I believe it is the same bird as *B. yunnanensis* the only difference being the cheek stripe which in one is dark chestnut, in the other black.—H. H. H.]

(83A) *Trochalopteryx holerythroptera* (Rippon).—Two specimens shot on 23rd July 1910 and a few others seen. Has a very pretty mellow whistle.

(98) MANIPUR STREAKED LAUGHING-THRUSH, *Trochalopteryx virgatum*.—Three nests found. In each case the nest was situated low down in a clump of thatching grass and was a large loosely built cup-shaped structure of dried grasses with a leaf or two worked in and lined with some loosely laid-in grass roots and feathery grass tails. The measurements were roughly $2\frac{1}{2}$ inches deep by 3 to $3\frac{1}{2}$ inches diameter internally. One bird was netted on its nest on 17th April, one was shot as it left its nest on 22nd April, and the third was allowed to go as its nest was found to contain a young bird and an addled egg on 30th April. The eggs were pure greeny blue, the colour one often sees in poor specimens of turquoise, and varied between $1.15 \times .8$ and $.98 \times .76$ and in each case there were two in the nest.

[Also procured by Col. Rippon at Mt. Victoria. Nest and eggs described in B. N. H. S. Journal, Vol. VIII.—H. H. H.]

(125) RUFOUS-NECKED SCIMITAR BABBLER, *Pomatorhinus ruficollis*.—One nest brought in by a Chin on 1st May with the bird noosed on the nest. It was said to have been found on the ground under a bramble and was composed of coarse grass stems and pine needles with an outer layer of dry bamboo sheath or some similar substance forming a thin walled cup partially domed over,

about 4 to 5 inches long by 3 to $3\frac{1}{2}$ inches in height. Eggs three, plain white somewhat pointed, $\cdot 94 \times \cdot 69$ to $\cdot 88 \times \cdot 68$. Bird not uncommon.

[Procured by Col. Rippon.—H. H. H.]

(130). McCLELLAND'S SCIMITAR BABBLER, *Pomatorhinus macclellandi*.—Three nests of this species were obtained. One was brought with the bird by a Chin on 19th April, and contained three eggs all well incubated. The other two were found by me, one on 13th and one on 18th April; the latter contained two young birds and an addled egg which I took; the former had only one egg in it when found, but three when taken on 18th. At that time the bird had been sitting very steadily for a day or two, bustling away half running, half flying, into the bushes when I approached. I netted one bird on the evening of the 17th and the mate was on the nest on the following day, but after very heavy rain on the evening of 18th I found the nest much broken in and apparently deserted and took the eggs. In both cases found by me the nest was situated on sloping ground under some bramble sprays and well hidden among dead canna leaves and woody herbs. It was a loosely constructed dome-shaped nest composed almost entirely of grass. Internal dimensions back to front 4 inches, bottom to dome 3 inches. Eggs measured from $1\cdot 05 \times \cdot 78$ to $\cdot 95 \times \cdot 75$ and one was only $\cdot 73$ in diameter.

[First record from Burma.—H. H. H.]

BRACHYPTERYGINÆ.

(191) INDIAN BLUE CHAT, *Larvivora brunnea*.—Bird quite common. One flew against the window pane and stunned itself one morning while we were having "chhota hazri."

Two nests were found of this species; in both cases the eggs were pure turquoise blue. The nest, placed on the ground in a bank, was a cup of dry pine needles lined with black hairs and a few leaves in one case and in the other was composed of grass stems lined with hair and feathers. The eggs were three in each case and well incubated, one being obtained on 16th May and the other on 26th June and their measurements were from $\cdot 78 \times \cdot 57$ to $\cdot 75 \times \cdot 55$.

[Found nesting at Mt. Victoria by K. C. Macdonal.—H. H. H.]

(211A) RIPPON'S BAR-WING, *Actinodura ripponi* (O. Grant).—One of a pair was shot by me on a tree on the outskirts of the jungle on 29th April.

[Described in Ibis, January 1907, p. 186. Found nesting by me at Sinlum, Bhamo.—H. H. H.]

BRACHYPODINÆ.

(279) BURMESE RED-VENTED BULBUL, *Molpastes burmanicus*.—A very common bird of which I took several nests in 1909 but only found one with eggs in 1910. There were three eggs.

(292) FINCH-BILLED BULBUL, *Spizixus canifrons*.—Also very common, several nests with hatchlings found in 1910.

SITTIDÆ.

(318) AUSTEN'S NUTHATCH, *Sitta nagaensis*.—Quite common, but no nests procured. Undoubtedly breeds at Haka, as many young fledglings were seen and one shot. One adult when shot remained hanging to the branch it was on, head downwards, until I got up and detached it when I found to my surprise that it was quite dead.

[Taken by Col. Rippon. Found nesting at Sinlum, Bhamo, by me. A bird found in the hills both on the East and West of Burma. Only got above about 5,000 feet, below this its place is taken by *S. neglecta*—H.H.H.]

CERTHIDÆ.

(355B). *Urocichla oatesi* (Rippon).—One nest obtained on 30th April 1910 on a sloping bank of dried grass beneath some trees. The bird was shot as it left its nest. The nest was a large oval-shaped, domed structure composed of an outer layer of dead leaves, canna leaves, coarse grass, etc., inside which was a layer of grass stems, fibres and a little moss, the cup being lined up to the level of the entrance with a plaster about 1-16th inch thick composed as far as I could determine of a substance which looked like chewed thistle stem or chewed grass. The bottom of the nest when taken was found to be quite moist from contact with

the damp ground.* The dimensions of the whole were exterior height 6 in., diameter back to front 5 in., side to side 4 inches. Entrance near the top about 2 inches across by $1\frac{1}{2}$ inches high. Interior diameter 2 inches each way, depth of cup inside from lower edge of entrance about one inch. Eggs three in number measured .73 by .6, .72 by .6 and .69 by .59, and were dull white sparingly freckled with reddish and faint purple.

[B. B. O. C., Vol. XIV, p. 83. Discovered by Col. Rippon at Mt. Victoria. Yours is the first record of its nesting.—H. H. H.]

SYLVHIDÆ.

(372) BROWN BUSH-WARBLER, *Tribura luteiventris*.—One nest found and bird netted on it on 27th April 1910. The nest was a large loosely-built ball of grass blades and leaves lined with fine grass-tails with a small opening on one side near the top. It was placed nearly on the ground supported between some stiff grass stems and herbs and overhung by thistles, bracken and grasses which concealed it so well that, even when I knew within a few inches where it was, I found considerable difficulty in locating it. The eggs were three, whitish spotted with reddish brown more thickly near the larger end. Measurements .73 × .56. Another nest which I am pretty sure belonged to the same species was obtained within a few days but the bird escaped out of my hand after being netted.

[Recorded by Col. Rippon from Mt. Victoria.—H. H. H.]

(420) TENASSERIM WHITE-TAILED WILLOW-WARBLER, *Acanthopneuste davisoni*.—One nest was brought in with the bird which had been noosed by a Chin. He stated he had found the nest

* Note.—Apropos of this nest, Major Harington informs me that when at Sinlum, Bhamo, in 1905, a similar nest and eggs were brought to him by a Kachin.

He accompanied the Kachin to the spot whence the nest was obtained, but saw no bird. In 1908 when he was up there again he hunted the same bit of jungle but never saw another nest. He did, however, shoot a specimen of *U. sinlumensis* there, so that in all probability the eggs he found in 1905 belonged to that bird.

Major Harington's nest was found in a very damp shady spot, very much like the situation of my nest, and his description of the lining of his nest as "a papier mache sort of cup" is a better description of the appearance of my nest than I have given. It is doubtless a provision to keep the inside of the nest dry.

on the ground in short grass. The nest was a little soft cup composed as follows: an outer layer of fibres and some grasses, inside which was a thickish layer of moss with a patch of black horsehair on one side, the whole being lined with a plentiful supply of soft black hairs intermingled with a few white ones. The internal diameter was less than two inches and depth about one inch. Eggs 4, pure white, measuring from $\cdot 61 \times \cdot 45$ to $\cdot 59 \times \cdot 44$. The same man brought in another nest three days later, on 28th April, which was exactly the same and also contained four eggs varying from $\cdot 6 \times \cdot 46$ to $\cdot 58 \times \cdot 46$, but as he had failed to noose the bird I could not be certain it was the same species.

[The nest must have been domed and the inside only brought you. I found it nesting on the Bhamo Hills and Oates on the Byingyi Hills.—H. H. H.]

(432) ANDERSON'S FLYCATCHER-WARBLER, *Cryptolopha tephrocephala*.—Nest taken and bird netted on nest by me on 21st May 1910. Nest was found on the ground near the top of a small bank about eighteen inches high and was well concealed by an overhanging tuft of grass and some herbaceous leaves. It was a largish oval-shaped, domed structure composed outside of coarse grasses loosely laid together, the entrance being on one side and well overhung. Inside, it was lined with very soft moss and thistle down, the moss well separated before being made into a compact cushion. The dimensions were outside height 6 inches, back to front $4\frac{1}{2}$ inches, side to side 4 inches. Diameter of entrance about one inch. Interior diameter about $1\frac{1}{2}$ inches, depth of cup from edge of entrance one inch. Eggs 4, pure white, measuring $\cdot 61 \times \cdot 46$, $\cdot 59 \times \cdot 46$, $\cdot 58 \times \cdot 46$ and $\cdot 58 \times \cdot 46$.

[Found by me nesting at Sinlum. My eggs slightly bigger than yours.—H. H. H.]

(460) AUSTEN'S HILL-WARBLER, *Suya khasiana*.—Very common. Several nests found, the most striking thing about which was the dainty roofing of moss always to be found worked into the grass of the dome, whether for concealment or for protection from rain I cannot say. The earliest nest was found on the 30th April and the latest with fresh eggs on the 20th June 1910. The

eggs varied very considerably in size and in colour, the largest being $.7 \times .52$, and the smallest $.6 \times .46$. The latter was exceptional, the average size being about $.67 \times .49$. The ground colour was sometimes distinctly greenish, sometimes white with no tinge of green and the amount of sprinkling also varied very considerably. These variations were so great that I am still in doubt whether some of my nests are not those of another species.

[Found breeding at Mt. Victoria by P. F. Wickham.—H. H. H.]

LANIIDÆ.

(495) SHORT-BILLED MINIVET, *Pericrocotus brevirostris*.—Quite common, but I only discovered one nest and that had young in it on 20th April. It was the most exquisite nest I have seen and I took a photograph of it which I am forwarding to the Society.

MUSCICAPIDÆ.

(579) VERDITER FLYCATCHER, *Stoparola melanops*.—One nest with four eggs was found in the wall of 800 yards firing point on the rifle range close to thick jungle on 1st May 1910. The stomach of the bird was full of remains of "lady-birds."

[Recorded by Rippon.—H. H. H.]

(594) RUFOUS-BELLIED NILTAVA, *Niltava sundara*.—One nest was found under a stone on 28th April and had three eggs. Another was found with two eggs in it on 11th August 1910, in a hollow in a cutting.

[Recorded by Rippon.—H. H. H.]

(603) YELLOW-BELLIED FLYCATCHER, *Chelidorhynx hypoxanthum*.—One specimen shot in thick jungle but not uncommon, I think, though no nests were found.

[Recorded by Col. Rippon.—H. H. H.]

(605) WHITE-THROATED FANTAIL FLYCATCHER, *Rhipidura albicollis*.—One nest with three eggs taken by me on 18th May and the nest photographed. The bird very common and once or twice seen flirting about on the ground. The eggs measured between $.70 \times .54$ and $.67 \times .51$.

TURDIDÆ.

SAXICOLINÆ.

(615) DARK-GREY BUSH-CHAT, *Oreicola ferrea*.—Very common. Eleven clutches of eggs and nests were taken, the earliest on 13th April and the latest on 28th April. The usual number of eggs in a clutch was four but two clutches of five were found. Out of the eleven clutches, found six consisted of pure (pale turquoise) blue eggs, without spots or markings of any sort. The others consisted of eggs similarly coloured but with a faint circle of brownish spots near the larger end, sometimes so faint as to be almost unnoticeable unless closely examined. One clutch taken on 21st April was remarkable in having one egg on which no markings were discoverable, one egg with just a faint smudge of brown near the larger end and the other three marked in the normal way.

[On two or three occasions (see B. N. H. Journals) I have pointed out the difference in the Burmese and Chinese eggs from the Indian which are pale greenish profusely spotted with rusty red; and when at home I told Hartert about it, and I see in his book he has found that the birds are different and has called the Burma bird after me. Here is the description :—

“Die Vögel der Paläarktischen Fauna,” p. 711, by Dr. E. Hartert. 1080 *Oreicola ferrea haringtoni*, Subsp. nov. Cat., eggs British Museum, Vol. IV, plate VII, fig. 18.

(Translation) “Distinguished from *O. ferrea ferrea* by the constantly shorter tail. Tail 57-61, 61·5 mm. Wing 65-68 mm. Mupin and other parts Szetchuan to Fokeni in S. E. China, also Burma and the Hill tracts S. of the Brahmaputra. Eggs darker blue than *O. ferrea ferrea* and in particular unspotted like those of the hedge-sparrow.” This is not quite correct.—H. H. H.]

RUTICILLINÆ.

(638) WHITE-CAPPED REDSTART, *Chimarrhornis leucocephalus*. Was a cheerful visitor, always announcing his arrival with a loud piping whistle but disappearing during the breeding season to slightly lower levels. I do not think he bred at Haka as I never could find any traces of him just during the breeding season unless

I went down into the valleys when he was easily found, though I never found the nest.

[A winter visitor ; breeds in the hills and in China. Not recorded by Col. Rippon from Mt. Victoria, but has been procured in other parts of Burma.—H. H. H.]

TURDINÆ.

(698) SMALL-BILLED MOUNTAIN-THRUSH, *Oreocincla dauuma*.—One specimen was shot in 1909. No nests.

[Recorded by Col. Rippon.—H. H. H.]

(704) LARGE BROWN THRUSH, *Zoothera monticola*.—One nest of this species was found on 15th May 1910. The bird was shot as it left its nest on 19th May. The nest was found about 15 feet from the ground in an elm sapling growing by a stream on the border of a strip of thickish jungle. It consisted of a large lump of earth for a basis, intermingled with sticks and fibres and with a little moss worked into the outside, the whole being scantily lined with some whitish roots or fibres. It was 4 inches across the interior and $1\frac{1}{2}$ inches deep giving it a shallow bowl shape inside, but the whole nest was about one foot in diameter. The whole structure was placed in a fork of the tree. The eggs, three in number, were pale bluish green with a dark cap of brownish red over the larger end, the whole with bold spots and smudges of the same colour. Measurements $1.28 \times .84$, $1.28 \times .83$ and $1.27 \times .87$.

[Not recorded from Burma before, and I believe this is the first record of its nesting.—H. H. H.]

FRINGILLIDÆ.

FRINGILLINÆ.

(779) TREE SPARROW, *Passer montanus*.—Common.

MOTACILLIDÆ.

(826) WHITE WAGTAIL, *Motacilla alba*.—A common winter visitor. No nests found.

(847) INDIAN PIPIT, *Anthus rufulus*.—One nest taken on 18th April and the bird netted on the nest. Eggs three, one of which was found on the ground outside the nest when the nest

was first discovered and when taken next morning had a small hole in it and some maggots.

ALAUDIDÆ.

Alauda japonica.—One nest and bird brought by my Chin collector on 30th April. The three eggs were all on the point of hatching.

[Recorded as breeding at Mt. Victoria by K. C. Macdonald. Also got there by Col. Rippon.—H. H. H.]

NECTARINIIDÆ.

(887) FIRE-TAILED YELLOW-BACKED SUNBIRD, *Æthopyga ignicauda*.—Very common but no nest found, except an old one which I think may have belonged to this species.

[Recorded by Col. Rippon.—H. H. H.]

CUCULIDÆ.

(1104) THE CUCKOO, *Cuculus canorus*.—One female shot on 30th April laid a soft skinned whitish egg in my hand as it died. The egg measured $\cdot 88 \times \cdot 6$. Another specimen contained a large yellow caterpillar or grub with a bright red head and five longitudinal black lines from head to tail.

(1113) RUFOUS-BELLIED CUCKOO, *Cacomantis merulinus*.—Fairly common. No eggs of either of these cuckoos were found.

ASIONIDÆ.

BUBONINÆ.

(1173) SCOPS OWL, *Scops giu*.—One specimen was shot at midday as it sat on a twig under some brambles. I mistook it at first for a specimen of *Felis chaus*.

COLUMBIDÆ.

TRERONINÆ.

(1283) KOKLA GREEN PIGEON, *Sphenocercus sphenurus*.—Common, but no nest found.

COLUMBINÆ.

(1307) SPOTTED DOVE, *Turtur suratensis*.—One nest taken which I think belonged to this species, but may have been a nest

of "*tigrinus*." The bird was so common that I forgot to make certain of its identity. Nests were also very common.

[*T. suratensis* not found in Burma, but *tigrinus*.—H. H. H.]

(1312) BAR-TAILED CUCKOO-DOVE, *Macropygia tusalia*.—Bird shot but no nest taken.

GALLINÆ.

PHASIANIDÆ.

(1327) GREY PEACOCK-PHEASANT, *Polyplectrum chinquis*.—One skin obtained by Mr. Street in 1908 on the border between the Haka sub-division and the Lushai Hills was seen by the writer but not carefully identified as he was not at the time aware of the possibility of its belonging to a distinct species.

(1331) MRS. HUME'S PHEASANT, *Phasianus humie*.—Not uncommon, as many as ten birds being seen on one occasion in one small clump of grass and dwarf date palm. One specimen had its crop full of acorns.

(1346) GREY-BELLIED HORNED PHEASANT, *Tragopan blythi*.—Often seen near Fort White though none seen by the writer near Haka. Only mentioned in these notes because referred to by Oates as a shy bird, whereas it was so bold when met on the road that a brother officer knocked one over with a stone after having several shots at it.

(1352) WESTERN BAMBOO-PARTRIDGE, *Bambusicola fytchii*.—Very common. Nest found under a clump of grass but all the eggs in it were broken.

(1374) CHINESE FRANCOLIN, *Francolinus chinensis*.—One brought alive by a Chin was kept for some time by the writer but eventually released.

HEMIPODII.

TURNICIDÆ.

(1382) BUSTARD QUAIL, *Turnix pugnax*.—Shot on 27th August 1910.

(1386) BURMESE BUTTON-QUAIL, *Turnix blanfordi*.—Not uncommon.

CHARADRIIDÆ.

Scolopacinae.

(1482) WOODCOCK, *Scolopax rusticola*.—Quite plentiful in the winter.

(1483) WOOD-SNIPE, *Gallinago nemoricola*.—Two specimens shot in 1909.

(1484) FANTAIL SNIPE, *Gallinago caelestis*.—Not quite so plentiful as the next.

(1485) PINTAIL SNIPE, *Gallinago stenura*.—A very fair bag of these could be made, but as the feeding grounds were small and far apart it required a good deal of walking.

(1486) HIMALAYAN SOLITARY SNIPE, *Gallinago solitaria*.—Two specimens obtained as already recorded in the Journal.

ANATIDÆ.

Anatine.

(1597) COMMON TEAL, *Nettion crecca*.—Shot on two occasions at Haka.

A NEW SNAKE *PSAMMOPHIS TRITICEUS* FROM BALUCHISTAN.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

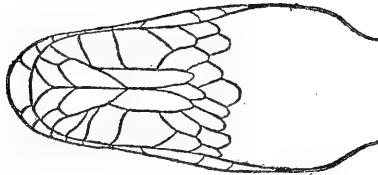
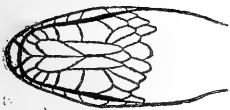
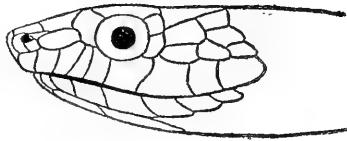
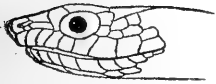
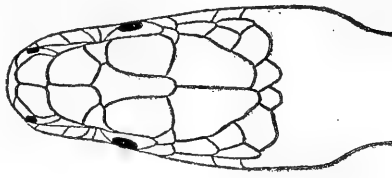
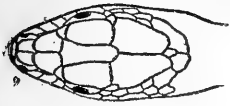
In Volume XX of this Journal (p. 1033), I remarked upon the collection of snakes in the Quetta Museum which had been submitted to me for identification.

Under the title *Psammophis schokari* I showed good reason to suppose that I had included two distinct species. This opinion is confirmed by the receipt of two more specimens from the Honorary Secretary, McMahon Museum, Quetta. It does not conform to the description of any other *Psammophis* in Mr. Boulenger's Catalogue, and I propose to name this new species *triticeus* on account of its wheaten colour.

The new species differs from *schokari* in having (1) fewer subcaudals, (2) three supralabials touching the eye, (3) the scales reducing posteriorly to 13 instead of 11, (4) in its markings, (5) probably its size (though on this point I cannot speak positively), and (6) finally and most important, its dentition.

I have now seen six specimens, and have been permitted to retain one from which I have obtained a skull preparation. The lengths of the two specimens now before me are $20\frac{3}{4}$ " and $24\frac{1}{2}$ ", the tails, respectively, 5" and $5\frac{1}{2}$ ". My largest *schokari* is 46", the tail $16\frac{1}{8}$ ".

Description.—*Rostral* touches 6 shields, the sutures subequal. *Internasals*—A pair, the suture between them three-fifths, that between the præfrontal fellows, rather less than the internaso-præfrontals. *Præfrontals*—A pair, the suture between them one-third greater than the præfronto-frontal, in contact with internasal, postnasal, loreal, præocular and frontal. *Frontal*—Touches eight shields, the fronto-supraoculars four or five times the length of the fronto-parietals. *Supraoculars*—Length equal to frontal, breadth two-fifths greater than the middle of frontal. *Nasals* divided; the posterior nasal is again divided into two superposed parts, touch the 1st and 2nd labials. *Loreal*—One, elongate, as



Psammophis triticeus
juv.
(nat. size).

Psammophis
schokari.
(nat. size).

long as the nasals. *Preocular*—One, touching the frontal. *Postoculars*—Two. *Temporals*—Two. *Supralabials*—9, the 4th, 5th and 6th touching the eye. *Infralabials*—6, the 6th largest, and in contact with two scales behind. *Sublinguals*—Two pairs, the posterior longer and in contact with the 5th and 6th infralabials. The snout is one-third longer than the horizontal diameter of the eye. *Costals*—Two headlengths behind head 17, midbody 17, two headlengths before vent 13. In the reduction of rows first the 3rd above the ventrals is absorbed into the row above or below; then the uppermost is absorbed into the vertebral. *Ventrals*—177 to 186. *Anal* divided. *Subcaudals* 75 to 88.

Colour.—Wheaten. A series of small black sub-apical short streaks on the sixth row above the ventrals, on the lower part of the 7th and upper part of the 5th rows. The interrupted formal

stripe thus formed begins on the neck as a continuation of the supraocular head stripes, and ends at the base of the tail. A greyish costal stripe involving the upper two-thirds of the last row, the penultimate, and the edge of the third row begins in the lore, passes behind the eye and extends down the body to the tail tip. A buff stripe intervenes between the two stripes above mentioned, and a second buff stripe involves the lower third of the last row, and the edge of the ventrals. In some specimens there is only a series of subapical spots on the 6th costal row, and no other stripes. There are three longitudinal dark stripes on the head, the median ending before nape. On the chin there are three stripes, one median, and two lateral, one on each lower lip, all being joined on the mental shield. There is also some central mottling on many of the gular scales, and on the anterior ventrals.

The dentition is as follows :—

Maxillary.—In front 5 small teeth, the first 3 increasing in size; then a gap which is succeeded by 8 progressively diminishing teeth, and finally 2 enlarged and grooved teeth. *Palatine*—10 to 11 subequal. *Pterygoid*—14 to 15 subequal. *Mandibular*—25 to 26, the first 4 or 5 increasing in size, after which the succeeding teeth progressively diminish in size.

[From the "PROCEEDINGS OF THE MALACOLOGICAL SOCIETY," Vol. IX,
Part VI, September, 1911.]

DESCRIPTION OF A NEW SPECIES OF *ACMÆA* FROM BOMBAY,
AND NOTES ON OTHER FORMS FROM THAT LOCALITY.

BY EDGAR A. SMITH, I.S.O.

Read 9th June, 1911.

SPECIMENS of an *Acmaea* from Bombay have recently been presented to the British Museum by Major A. J. Peile, R. A., and as the genus has not been until recently¹ recorded as inhabiting the shores of India, it seemed desirable to give an account of the present species. Its existence at Bombay, however, has been known to me since the year 1882, when the late Dr. W. T. Blanford gave to the Museum a dozen examples. These, however, were only about half the size of those received from Major Peile.

The shores of Bombay are not very prolific in limpet-like forms such as *Patella*, *Acmaea*, etc. Messrs. Melvill & Abercrombie² enumerate the following:—

1. *Fissurella Bombayana*, Sow. = *lima*, Sow.
2. *Emarginula elongata*, Phil.
3. *E. radiata*, Gould.
4. *Scutum unguis* (Linn.).
5. *Patella aster*, Reeve.
6. *Clypidina notata* (Linn.).

No. 2. *Emarginula elongata*. Philippi never published a species under this name, but he quoted³ the Mediterranean shell described by Costa with that appellation. This is quite distinct from the shell figured by A. Adams & Sowerby as "*E. elongata*, Philippi."⁴

The specimens from Bombay thus identified have kindly been sent to me for examination by Mr. J. C. Melvill, who borrowed them from the Manchester Museum, where they were placed by Mr. Abercrombie, by whom they were collected. A careful study of them proves that they are neither the *elongata* of Costa nor of the *Thesaurus* but are certainly identical with *E. dilecta*, A. Ad., originally said to be from King George's Sound, South Australia. In the Museum there are several specimens collected at Bombay by Mrs. Deakin, by whom they were presented.

The "*E. elongata*, Philippi" of the Abercrombie & Melvill list must therefore be regarded as a mere *nomen nudum*.

No. 3. The *Emarginula* (*Clypidina*) *radiata* was described by Gould from

¹ Preston, Records Indian Mus., vol. vi, p. 39, *Acmaea Travancorica*.

² Mem. Proc. Manchester Lit. Phil. Soc., ser. IV, vol. vii, p. 41, 1893.

³ Enum. Moll. Sicil., vol. i, p. 115, pl. vii, fig. 13.

⁴ *Thesaurus Conch.*, vol. iii, p. 212, pl. 246, fig. 33.

Sydney Harbour, and was supposed by Tenison-Woods to be the same species as *E. australis*, Lamk. As Lamarck never described an *E. australis*, possibly the species characterized under that name by Quoy & Gaimard was referred to.

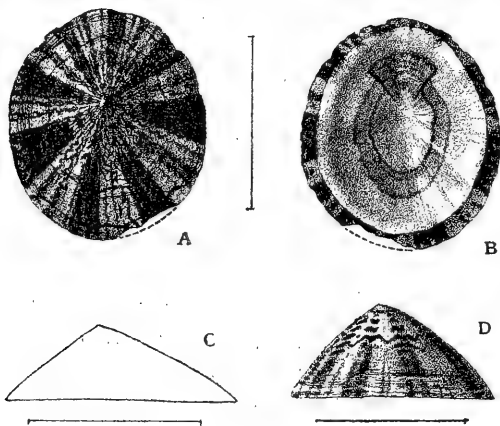
I have not seen any specimens from Bombay, so cannot confirm the identification by Mr. Abercrombie. The species, however, should be placed in the genus *Submarginula*. It has never been figured, and without examining the type it is almost impossible to know its true relationship.

No. 5. *Patella aster*, Reeve, appears to be the only species of the genus hitherto met with at Bombay. It is variable in colour; the white rays, which are inconstant in number (although nine are often observable) are hardly visible externally in some specimens. In the type the nine rays are very striking, as the shell figured by Reeve has been much cleaned. In one example collected by Major Peile the dark rays are so broken up that the markings hardly look like radiations.

Pilsbry (Man. Conch., vol. xiii, p. 147) unites this species with the *Patella novemradiata* of Quoy & Gaimard, described from the Mauritius, but as I do not feel convinced of the certainty of the identification I prefer to name the Bombay shells *P. aster*, about which there is no doubt, since a comparison of the series of specimens collected by Major Peile proves their identity beyond question. It seems to me more likely that the Mauritian *novemradiata* may be a form of one of the African species, e.g., *rota*, Gmelin, or *capensis*, Gmelin. The animal of *P. aster* has not hitherto been studied, but an examination of the radula shows that this species belongs to the genus *Helcioniscus*, in which it is located by Pilsbry.

ACMÆA BOMBAYANA, n. sp. Figs. A-C.

Testa ovato-rotundata, mediocriter elata, vertice paulo antemediani, fusco et albo radiata, interdum minute fusco reticulata, radiatim tenuiter striata, striis incrementi tenuissimis sculpta; radii albi, sæpe in paribus



dispositi, radio fusco intermedio quam cæteris pallidiori divisi; facies interna alba, area centrali pallide olivaceo-fusca, limbo definito albo et rufo-fusco notato, haud crenulato. Long. 17·5, diam. 15, alt. 6·5 mm.*

About the same form as the Bombay *Patella aster*, but differing in other respects. *Acmaea parasitica* (d'Orbigny) is a little like the present species, but rather more ovate, and "arched in every direction in consequence of attaching itself to other shells" with convex surfaces. On the contrary all the specimens I have seen of *A. Bombayana* appear to have rested upon flat or almost level surfaces, as the margin is even and unarched all round.

The rays are generally of two shades of brown, some much darker than others, and the paler ones nearly always falling between the white rays, which frequently appear to be in pairs. In addition to the rays a fine brown and white reticulation not infrequently occurs. The fine radiating thread-like lines are only observable in well-preserved specimens. The interior is thickened with a white callus deposit, excepting the central portion, which is stained a pale livid olive and defined from the white part of the interior by a distinct horseshoe-shaped margin. The outer limbus is thin, sharply defined, and prettily marked with the ends of the brown and white rays.

Var. CEYLANICA. Fig. D.

Like the type, but a trifle more elevated, without the fine brown reticulation, but with the darker rays commencing as spots or dots near the apex. Largest specimen 19·5 mm. in length, 16 in diameter, and 9 high.

Hab.—Galle, Ceylon (H. F. Blanford).

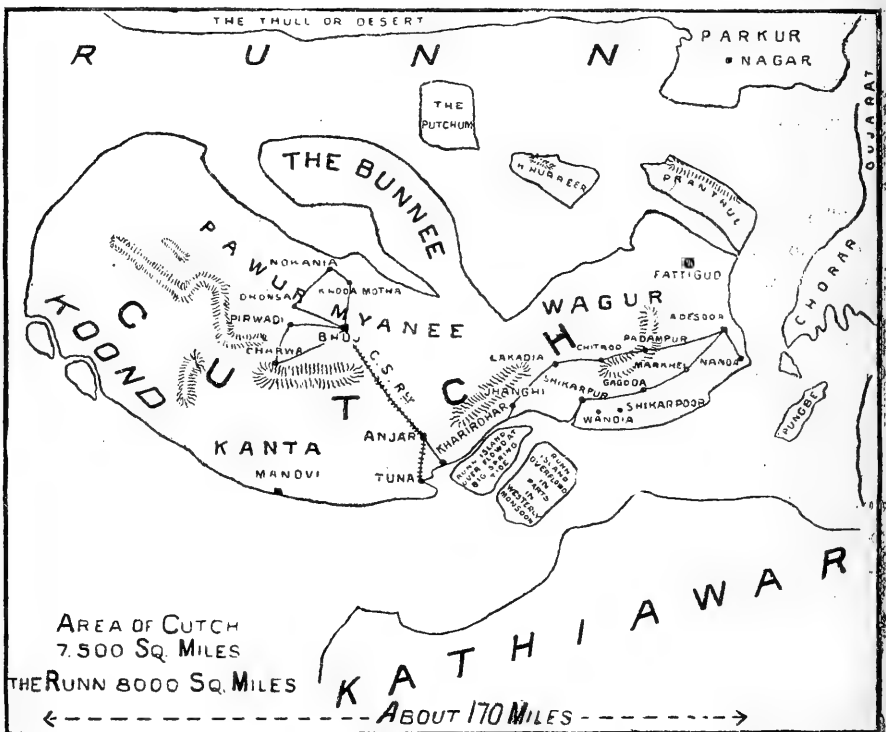
The increased elevation of this variety is probably due to its occurrence in a more exposed position than the Bombay shells. It has been observed with regard to our common limpet, *Patella vulgata*, that specimens occurring near high-water mark, and consequently more exposed to the breaking of the waves, are higher and more conical than those found lower down on the shore.

The *Acmaea Travancorica*, Preston, has an arched lateral basal margin, is differently coloured ("pale brownish yellow with occasional blotches of dark purple"), and more roughly sculptured. The colour of the interior of the shell is not described, but it is merely said to be iridescent. The margin is described as "regularly spotted with purple." This iridescence and the apparent absence of a defined limbus or border seem to indicate that this species has more affinity to the Patellidæ than the Acmaeidæ.

* An average specimen. The shell figured is 22 mm. in length, 19 high and 7 in height.

PROGRESS OF THE MAMMAL SURVEY.

When the last report was published (page 229 of the last Journal) Mr. C. A. Crump, the Society's first Collector, had finished his tour in the Berars. As the rains were approaching it was decided to send him to Cutch and he arrived there on the 6th July 1911. H. H. the Rao Saheb and H. H. the Kumar Saheb being both keen naturalists as well as sportsmen lent our Collector every assistance, and as a result the Cutch collection is a fairly representative one. H. H. the Rao Saheb has kindly consented to fill in the few blanks which were left. Mr. Crump collected at Bhuj, Rhoda Motha, Nokania, Dhonsa, Charwar, Pirwadi, Anjar, Gagodar, Makhal, Nanda, Adesoor, Padampur, Chitrod and finally worked back to Bhuj, finishing early in October. He obtained some 350 specimens, all of which will be described in Mr. Wroughton's report in our Journal in due course. Amongst the specimens was



Rough map of Cutch—drawn by Mr. C. A. Crump—showing the places visited by him when collecting mammals.

a new genus of rock-rat which Mr. Wroughton describes in this Journal (page 340) under the name *Cremnomys cutchicus*.

Mr. Crump returned to Bombay and started for the Central Provinces in October commencing at Asirgarh and then collecting at Hewra, Siwal, Mandwa, Chandgarh, Ganoor, all in Nimar, and up to the end of December had obtained some 167 specimens. Unfortunately he has not been able to obtain much assistance so far from the natives in the C. P., and has found them unwilling to help even when they are offered money for specimens. He writes, "a very little help from the natives and I could have got foxes, but the people of Nimar have not the faintest notion of shikar; they ran down a few hares and caught some rats in their huts, nothing more. I offered Rs. 3 for a porcupine and up to Rs. 5 for large mammals that were out of the ordinary. I offered rewards if they would show me 'earths' or other hiding places, but there was no response."

Mr. Shortridge, the second Collector, arrived in India on the 20th October 1911, and started collecting at once at Dharwar in the Southern Mahratta Country. The Society are under a great obligation to Mr. R. M. Phillips, the District Superintendent of Police at Dharwar, for the invaluable assistance he has given to Mr. Shortridge, who in writing says that in consequence of Mr. Phillips' assistance there has been no dearth of specimens from the first, whilst every difficulty has been removed. Mr. Shortridge obtained some 571 specimens from Dharwar, Devikop, Gadag (where Mr. T. J. Spooner, C. E., an old member of the Society, rendered him much assistance) and Potoli, all in the Dharwar district.

Mr. Shortridge is now in North Kanara and proceeds south through Kanara into Mysore territory and gradually into Southern India.

"The Field," commenting on the progress of this Survey in their issue of the 10th February 1912, states: "So far, therefore, as the Survey has hitherto extended, it tends to show that India has been thoroughly well worked in respect of its mammalian fauna; most of this work, it should be remembered, having been accomplished by amateurs." Such a statement as this is not calculated to help the Society in the work they have undertaken nor is it fair to draw such general conclusions from the first report of the

Mammal Survey. A glance at the original prospectus issued by our Society in connection with the Mammal Survey would have revealed the reasons why it was undertaken, not to try and discover new species, but because "no systematic collection of the mammals of India has been made since the time of Hodgson, Horsfield, Elliot, Sykes, Jerdon, and Blanford. . . . a few private volunteers, Colonel Ward, Major Dunn, Major Magrath, Mr. Whitehead and others, have lent a helping hand in recent years, but progress in this manner has been necessarily very slow." The lack of specimens of Indian Mammals in the National collection at the British Museum (Natural History), South Kensington, is deplorable,* and it is with the idea of helping our own collections as well as that of the National collections that the Survey was resolved upon by our Society. The Survey was not undertaken merely to obtain new species, otherwise we should not have commenced by sending our Collectors to Khandesh and Dharwar, and Mr. Wroughton from the British Museum (Natural History), writing on 5th February 1912, says, "the topotypes in the Dharwar lot are invaluable, the first really firm foundation we have had."

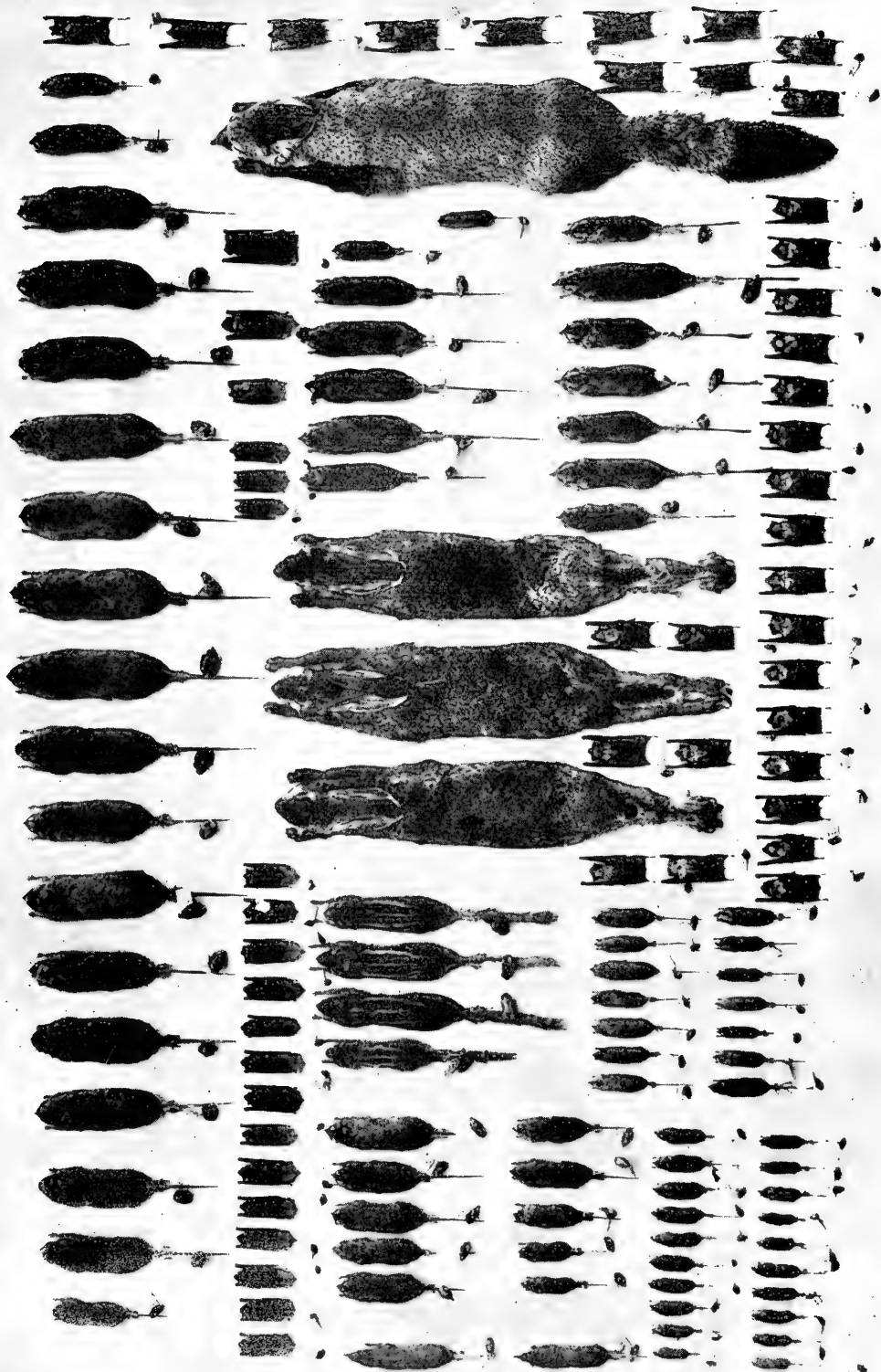
This is sufficient encouragement to us.

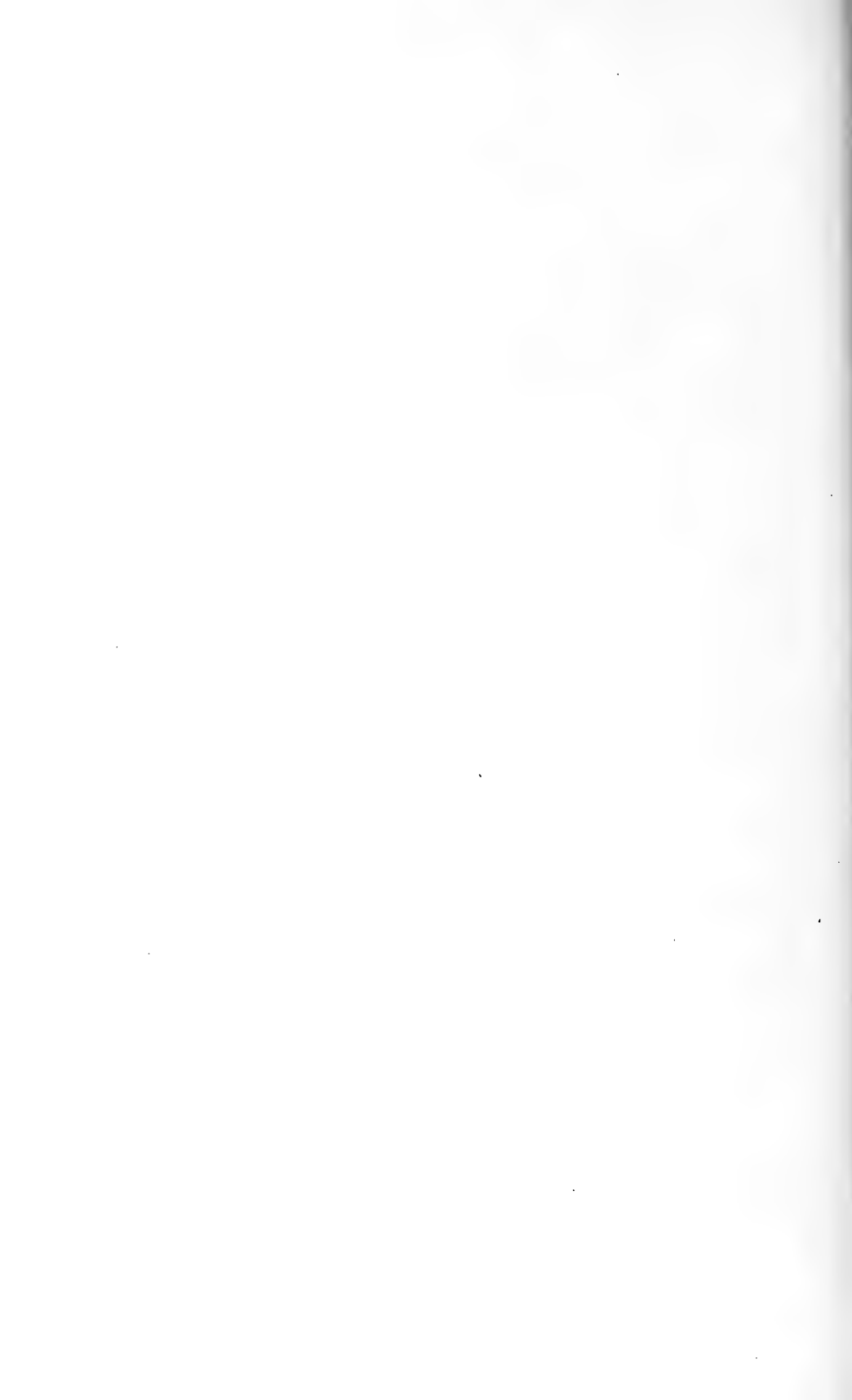
As regards finance, when the last Journal was published some Rs. 20,816 had been received for the special fund for carrying on the Mammal Survey. Since then the Society has received some Rs. 5,582, so that the total received up to date is Rs. 26,398, out of which Rs. 9,879 has been spent.

The Survey with only two Collectors will take several years to complete and therefore we must try and obtain a further Rs. 25,000 or Rs. 30,000. This should not be very difficult as our members will surely appreciate the value of the work as it proceeds, and as they see the results being published in Mr. Wroughton's reports in the Journal. The first report (Khandesh) appears in this number (page 392) and the 2nd (Berars) and 3rd (Cutch) have also been received and will appear in the next number of the Journal.

March, 1912.

*Mr. Oldfield Thomas in our original prospectus wrote as follows :—"There is no doubt that the representation of our Indian Mammal Fauna in the National Museum has fallen behind other parts of the world and is very far short of what it should be."





MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal			
No. 1 of Vol. XXI	20,816	2	0
"Another Piffer"	50	0	0
Bikaner, H. H. the Maharaja of	1,000	0	0
Blunt, A. W.	15	0	0
Burns, Cecil L.	50	0	0
Brodie, D.	25	0	0
Broughton, Capt. T. D.	15	0	0
Bute, The Most Hon. Marquis of	1,427	3	0
Budd, Lt.-Col. N. A. H. (2nd Donation)	50	0	0
Chamba, H. H. the Raja of	150	0	0
Clifford, Capt. R.	10	0	0
Cook, J. P.	15	0	0
Culbertson, T. M. S.	15	0	0
Currey, Capt. V. F.	30	0	0
Dallaporta, J. N.	15	0	0
Deane, Dr. A. H.	15	0	0
Dewas (Junior), H. H. the Raja Saheb of	100	0	0
Dumayne, Sir F. G. (2nd Donation)	10	0	0
Fraser, W.	50	0	0
Fyson, P. F. (2nd Donation)	15	0	0
Gilbert, Reginald	25	0	0
Heath, R. H. (2nd Donation)	10	0	0
Hide, P.	50	0	0
Hulbert, Major J. G.	10	0	0
Hunt, Capt. A. T.	45	0	0
Indore, H. H. the Maharaja Tukojirao Holkar of	1,000	0	0
Jeejeebhoy, Sir Jamsetjee, Bart.	100	0	0
Jenkyns, H. H.	15	0	0
Joly, P. B.	15	0	0
King, R. C. H. Moss. I.C.S.	15	0	0
Kolhapur, H. H. the Maharaja of	200	0	0
Lewis, J. S.	15	0	0
Lucknow, Provincial Museum	200	0	0
Messent, P. G.	15	0	0
Millard, W. S. (2nd Donation)	200	0	0
Moberly, C. N.	25	0	0
Montagu, The Hon'ble E. S.	99	0	0
Morris, Major R. L.	20	0	0
Nevill, Thos. N. C.	15	0	0
Norman, H. C.	15	0	0
Perfect, S. R.	25	0	0
Perreau, Capt. G. A.	15	0	0
Petit, Sir Dinshaw M., Bart.	50	0	0

NAME.	Amount.		
	Rs.	A.	P.
Phillips, Capt. E. H.	20	0	0
Pickthall, Capt. J. W.	15	0	0
Peall, Lt.-Col. S. E... ..	56	0	0
Purkis, F. C. (2nd Donation) ..	10	0	0
Reichwald, Capt. W. F.	15	0	0
Rogers, K. St. Aubyn	10	0	0
Sale, E. L., I.C.S. (2nd Donation) ..	25	0	0
Slade, Rear Admiral Sir H. E. (2nd Donation) ..	60	0	0
Suter, Dr. M. F. (Rs. 10 per month for January, February and March 1912) ..	30	0	0
Tweedy, A. G.	10	0	0
Tyabji, S. B. (2nd Donation) ..	10	0	0
Tyler, H. H. F. M., I.C.S.	30	0	0
Ward, Major C. H. (2nd Donation) ..	15	0	0
Whistler, H. (2nd Donation) ..	5	0	0
Wickham, P. F.	25	0	0
Witt, D. O.	10	0	0
Total ..	26,398	5	0

REVIEWS.

"FORTY YEARS AMONG THE WILD ANIMALS OF INDIA."

(SOME NOTES ON A NEW BOOK.)

Above is the title of a book recently published, the author of which is Mr. F. C. Hicks, late Deputy Conservator of Forests. It deals especially with tiger shooting, but apart from this the author has expressed opinions on two subjects to which I wish to invite attention.

I.—GAME PRESERVATION.

In his delightful book "Leaves from an Indian Jungle," Major Glasfurd some years ago gave a startling account of the extent to which game is destroyed in the Central Provinces by native shikaris who sell the skins and heads to traders, and shewed that there exists a very considerable trade in shikar trophies which there is at present apparently no means of checking.

Mr. Hicks now furnishes us with some equally remarkable information as to the sale of the flesh of game in some districts. For instance, he writes of the Dehra Dun district "With Dehra and Mussoorie within easy reach there is always a good market for the sale of venison and other game. Consequently the reader may go at almost any time of the year to the Dehra bazar and at a certain butcher's shop he will be able to buy venison at two annas a seer; this, with mutton selling at five annas a seer in itself speaks for the amount of deer that must be slaughtered for this market." Again, after mentioning the sale of pheasants' eggs at Mussoorie at a much cheaper rate than fowls' eggs, he continues "I also know of several hotels which maintain a number of professional shikaris, whose business it is to obtain game for their hotels."

Again, "It may be argued that the cases I have mentioned are exceptional owing to the proximity of two large towns, such as Dehra and Mussoorie. But this is so only in the matter of degree * * * * * I was camped lately near a group of villages in the heart of a large jungle. I sent my servant to a butcher whom I had heard of at one of the villages. His reply was that he only killed domestic animals once a week, as it did not pay him to kill more on account of the amount of deer that the local villagers shot or trapped. I found the same demand to exist all over the Central Provinces and Mysore, no matter how uncivilised or out of the way the places might be."

Of course there is little that is really new in this, while, as Major Glasfurd has pointed out, the root of the trouble lies in the number of guns in the possession of native shikaris, and the extreme difficulty of satisfactorily enforcing game regulations by means of more or less venial native subordinate officials so long as these guns exist.

I am not sufficiently conversant with the subject to discuss the difficulties in the way of reducing the number of guns, but it seems probable that but a small portion of these are needed for the protection of cultivation against the depredations of game, and that there is room for a large reduction in the number of licenses now granted, assuming that in the majority of cases the native shikari's possession of his gun is legal under existing conditions.

But the main point to which I wish to invite attention is that all or nearly all the illegal slaughter of game that goes on is for profit, whether by sale of horns, skins, or flesh. Put an end to the demand and the supply will cease. This is Mr. Hicks' contention, with which I for one am entirely in agreement. What he would do is to prohibit by law the sale or purchase of game in any form whether flesh, skins, horns, or feather. It does not seem that there would be anything unreasonable or impracticable in such a prohibition, though certain exceptions to the general rule might be found advisable.

Since writing the above I have learned that a new Bill on the subject of Game Preservation, prepared after consultation with the Local Governments, is now under consideration by the Secretary of State. Whether it contains any provisions against the traffic above mentioned is doubtful. In any case, as this bill will presumably come up before the Legislative Council before very long the present juncture would seem not inopportune for calling attention to the subject. Is it too late for the Society to make a representation in the matter? If there be any doubt as to the need for some action it should be possible with the Society's present large membership to obtain within a short time a sufficiency of information upon which to form an opinion.*

II.—TWO SPECIES OF PANTHER.

I had imagined that in spite of opinions to the contrary, specially among an earlier generation of Indian sportsmen, science had decided once for all that there was no specific distinction between the large "panther" and the smaller "leopard" of some writers. This for the reason that a large series of animals shows such a number of intermediate variations between two types in size, colouring, length of tail and even shape of head that it is impossible to separate them.

In this connection Mr. Lydekker writes, however, that if the two forms are, as a whole, distinguishable and restricted to particular localities, they

* Mr. Dodsworth's interesting article on the "Protection of Wild Birds in India" in the last number of the Journal affords evidence of the success of recent legislation directed against the Indian Plumage Trade, and encourages one to hope that the efforts of Mr. Hicks and others on behalf of the deer, &c., may not prove unavailing.

are undoubtedly entitled to recognition, *e.g.*, as "geographical forms" not as distinct species.

Mr. Hicks, has no doubts on the subject, defining two distinct species as below:—

- (I) The Panther, with the following characteristics:—
 - (a) Weight about 150 lbs.
 - (b) Length of body alone about 5 feet, length of tail about 2 feet.
 - (c) Smooth shining coat with clearly defined rosettes.
 - (d) Longer and more pointed skull with strongly developed occipital ridge.
 - (e) Having 22 caudal vertebræ in the tail.
- (II) The "Pantheret":—
 - (a) Weight about 50 lbs.
 - (b) Length of body about 3 feet, length of tail $2\frac{1}{2}$ to 3 feet and more.
 - (c) Shorter and rounder skull with no occipital ridge.
 - (d) A dull rough coat and blurred rosettes.
 - (e) Having 28 caudal vertebræ in the tail.

These dimensions are said to be those of an average animal in its prime, but both "species," especially the first, are admitted to vary considerably.

Now these differences are in the main those long recognised as existing between the typical "panther" and "leopard," but which have been weighed in the balance and found wanting. It is the final difference in the number of the caudal vertebræ that has captured my attention and induced me to write this note.

I am unaware whether Mr. Hicks is the first to call attention to this character. But if the difference is a constant one and no intermediate variations occur, we have surely here a permanent structural difference which absolutely warrants specific distinction. With the number of shikaris there are among the members of the Society in different parts of India it should not be difficult to decide the question.

Apart from this point, the author's differentiation would leave me unconvinced. My own experience in this direction has been mainly confined to North Gujarat; during $2\frac{1}{2}$ years in the Mahi Kantha Agency I measured a sufficient number of panthers to afford a fair idea of the average size; I find that I have a record of 19 adult specimens shot in that district, of which I give the following particulars for what they may be worth:—

Length of body (in a straight line) varies in 11 males from 3 feet $7\frac{1}{2}$ inches to 4 feet $6\frac{1}{2}$ inches, in 8 females from 3 feet $\frac{1}{2}$ inch to 3 feet $7\frac{1}{2}$ inches. Length of tail varies from 2 feet 2 inches to 2 feet $9\frac{1}{2}$ inches. In colouring and comparative smoothness of coat the larger individuals correspond more or less to Mr. Hicks' "panther," the smaller to his "pantheret," with some intermediate variations. But in view of the great

difference between the average size of Mr. Hicks' two species I should find it extremely difficult to place these Gujarat animals, not having in those days ever thought of counting the caudal vertebrae.

The author is very severe on the sportsman who says he has killed a panther when he has shot an animal of the smaller type, which is rather unkind if one considers that modern scientists all tell the sportsman that the small beast is a panther.

To the ordinary use of the word "leopard" Mr. Hicks strongly objects. And of course he is perfectly right in pointing out that the original *leopardus* was undoubtedly *Felis jubata* (*Cynaelurus jubatus*). But when he remarks that "*pardus*" means "spotted," not "rosetted," implying that the animal known to the ancients as "*pardus*" was not the panther, I think, he is wrong; the panther is not the less spotted because his spots are arranged in rosettes. But in any case the ordinary use of the word leopard has existed for centuries, and is too general for there to be any hope of correcting the error now; the name panther indeed in its true application is hardly known out of India. Under the circumstances one cannot agree with the author when he stigmatizes the man who calls the panther a "leopard" as ignorant and immoral! More especially seeing that in spite of his zeal for correct nomenclature he invariably calls the gaur what it is not—a bison. The latter misnomer, if sanctioned by practice, is yet no more excusable than in the case of the leopard. While his spelling of "cheetle" for "chital" if original, is not to be admired.

However, these are trivial blemishes in what is one of the most remarkable books on Indian big game that has been written. Certainly no writer of whom I am aware has displayed a knowledge equal to this author's of the habits of the tiger, and his chapters on the theory and practice of beating for tigers deserve the sportsman's careful study. But I have no intention here of trying to review Mr. Hicks' book and have already written more than I meant to do. I will only add that the author records the shooting of an *undoubted hybrid between tiger and panther* of which he says "its head and tail were purely those of a panther, but with a body, shoulders and neck-ruff unmistakably of a tiger, the black stripes being broad and long though somewhat blurred and breaking off here and there into a few blurred rosettes, the stripes of the tiger being most predominant on the body." The animal was an old male and measured a little over 8 feet in length. This unique trophy unfortunately disappeared during the confusion, and subsequent illness of the author, that followed on a severe mauling which he sustained. Is there any other record of such a hybrid at any rate in the wild state?

A. H. MOSSE, CAPT., I. A.

DWARKA, September 1911.

MEDICAL ENTOMOLOGY.

Entomology for Medical Officers: By A. Alcock, C.I.E., M.B., LL.D., F.R.S., etc., Lecturer on Medical Entomology, etc., at the London School of Tropical Medicine. Lately Superintendent of the Indian Museum, and Professor of Zoology in the Medical College of Bengal. Sometime Surgeon-Naturalist to the Indian Marine Survey. London, Messrs. Gurney and Jackson, 1911, Price 9 shillings net.

The publication by Colonel Alcock of an Entomological Text-book will come as a surprise to those who know him as one of the leading authorities on the abyssal fauna, but it cannot be said that the admirable work before us has suffered in being written by one who is a naturalist in the true sense of the word, not merely a specialist in the narrow sense. For some years past Colonel Alcock has been occupied in organizing and conducting in the Seamen's Hospital at the Royal Albert Docks a course of medical entomology for doctors, missionaries and others interested in tropical medicine. His "Entomology for Medical Officers" is therefore the result not merely of theoretical knowledge but of practical experience. Perhaps the most striking feature of the book is its remarkable lucidity. It is not an easy task to give students to whom "entomology is a means rather than an end," a precise idea of the classification and structure of those Insects, Arachnids and other Arthropods—for the scope of the work is not limited to the Insects in a limited sense—that are noxious to man's person. That this has been achieved no one who reads "Entomology for Medical Officers" can doubt. Further, a great simplification has been introduced into the classification of the mosquitoes, especially of those which belong, in a wide sense, to the genus *Anopheles*; so that we are now within reasonable distance of a complete revision of the Culicidae in which the accumulation of "bad" species and worse genera that the last few years have produced will be swept away and it will again be possible to regard an interesting family of Insects not merely as a happy hunting-ground for the species-monger but as a legitimate object of study to the zoologist; for no scientific study of any group of animals can be successful so long as it is viewed from a prejudiced standpoint that encourages the production of hasty work, and in the case of a group of great practical importance it is the ordinary man, not merely the zoologist, who suffers from hasty work such as that recently lavished on the Culicidae. Colonel Alcock is a doctor as well as a zoologist, and it is his good fortune also to be endowed with a literary style of uncommon merit. No better trial of qualifications could be imagined in the production of a text-book on medical zoology, so long as no one of them is allowed to dominate the rest, and in this case the three are united in perfect harmony by experience. The book can be

recommended not only to medical men, but to all who are interested in insects, their structure and their habits. The many illustrations, although of a simple nature, show what they are meant to show, and are not mere embellishments. The book itself is easily handled. Would that such works were commoner in entomology!

N. A.

OBITUARY NOTICE.

E. W. OATES.

The death of Mr. Eugene William Oates, which occurred at Edgbaston, Birmingham, on the 16th of November, will be greatly regretted by all ornithologists and more especially by those who have made a study of the Birds of India. For some years past he had been in failing health, and his death at the comparatively early age of 66 was therefore not unexpected.

Mr. Oates was an officer in the Public Works Department in Burmah from 1867 to 1899, and rose to the highest positions in that branch of the service. He was an ardent naturalist, and all his spare time was devoted to the study of his favourite science.

As an ornithologist Mr. Oates had few equals, and will long be remembered for the excellence of his writings. When in England in 1882-83 he spent much of his time at the British Museum, Bloomsbury, in preparing his first well-known work "*A Handbook to the Birds of British Burmah.*" Subsequently he wrote the first and second volumes on Birds in the *Fauna of British India*, edited by the late W. T. Blanford—which volumes may justly be regarded as models of what such works ought to be. The present seems a fitting opportunity to explain a ridiculous passage which appeared in the otherwise admirably written second volume and which has long puzzled ornithologists. In volume ii, p. 290, Oates (apparently) writes that the note of the Streak-eyed Wagtail *Motacilla ocularis* is "a prolonged Pooh." The explanation of this remarkable statement may now be given, the author and editor, as well as the perpetrator of the joke being now, alas, dead. When Oates was in the middle of preparing his second volume, at the Natural History Museum, the writer and the late Dr. Sharpe happened to pass the table covered with his manuscript on their way to lunch, and Sharpe, who loved a joke, said "let us add something funny to Oates' description of this Wagtail," little thinking that his remark would ever get into print. He never doubted that the eagle-eye of the author would detect and strike out the line, after having a laugh over it, knowing the source from whence

it came. The incident was forgotten, the volume completed and Oates returned to India. The revised proofs were sent to him by Blanford for correction and passed, but the long forgotten joke unfortunately remained unnoticed! Thus it happened that a Wagtail was described as having an impossible note, which has long been a puzzle to ornithologists—a warning to all practical jokers.

His other well-known works included a second edition of "*Hume's Nests and Eggs of Indian Birds*" and a "*Manual of the Game Birds of India*." He also wrote the first and second volumes of the "*Catalogue of the Collections of Bird's Eggs in the British Museum*," and was joint author with Capt. Savile G. Reed of the third and fourth volumes of the same work.

Mr. Oates was an accurate observer in the field and his fine collection of Burmese Birds and their eggs now forms part of the National Collection.

In the last years of his life he was deeply interested in that most difficult group of Kalij and Silver Pheasants which are included in the genus *Gennæus* and he formed a fine collection of these birds which was transferred to the Natural History Museum shortly before his death. His views on this difficult group of birds were much at variance with those of other ornithologists, and probably many of the individuals which he regarded as representing species or sub-species should really be considered as hybrids, which undoubtedly occur among wild birds of this group. His collection, however, contained many types and the Trustees of the British Museum were fortunate in acquiring it.

Mr. Oates was elected a member of the British Ornithologists' Union in 1884 and acted as Secretary from 1898 to 1900: he also joined the British Ornithologists' Club in 1893, soon after its commencement. He was a Fellow of the Zoological Society of London, &c., and a popular member of the Savage Club.

W. R. O. G

MISCELLANEOUS NOTES.

No. I.—THE NUMBER OF CUBS IN A TIGER'S LITTER.

In May 1911, I was out in the C. P. after tiger, when a tigress was shot. On being skinned it was found that the uterus contained 4 fœtus, within a few weeks of being born. I took measurements and they were :—

Length of body	..	..	12 inches.
Length of tails	..	..	6 inches.

Total .. 18 inches.

Their skin was properly formed, coloured and striped, and the bones and teeth hard and firmly set. It was only the absence of preserving liquids and jars that prevented me bringing them back.

Another tigress I shot had a family of 3 cubs a few months old, but although I often saw their tracks, I never got a glimpse of them. I have also heard of many litters of three. I see W. S. Burke in his *Indian Field Shikar Book*, says concerning cubs that "seldom more than two are reared"; does this mean that one or two always die or get killed, for as far as I have heard, 3 in a litter seems very common, while only 2 rather unusual.

C. R. S. PITMAN, 2ND LT.,

ALIPORE, August 1911.

27th Punjabis.

No. II.—THE STOAT IN KASHMIR.

On the 15th August while ascending a high mountain, near Pahlgam, Kashmir, with a climbing party, and when crossing a snow patch at about 14,000 feet a coolie carrying the tiffin basket suddenly drew my attention to a stoat which was showing its head at the visible base of a point of rock jutting out of the snow. It ran out on to the rock and I had a good look at it through glasses, but the combined effect of a defective cartridge and an excited terrier prevented my securing it.

From its size, however, its chestnut colour above, its yellowish white underparts and the black tip to the tail I came to the conclusion it was an example of *Mustela erminea*, the Common Stoat. If the lair was under the rock where I saw it the situation was an extraordinary one, for the surroundings were nothing but bare rock and snow. And what this little carnivore could have found to live on in this inhospitable spot I could see no sign of.

KASHMIR, September 1911.

H. A. F. MAGRATH, MAJOR.

[It was unfortunate Major Magrath was unable to secure the specimen as it would have been interesting to see to what race this Stoat belonged, whether *M. whiteheadi* or *M. erminea*.—Eds.]

No. III.—A DEFORMED THAMIN STAG (*CERVUS ELDII*).

I enclose a photograph of a deformed Thamin head shot by me last March in Manipur. To bag a Thamin in Manipur necessitates hard work and early rising. Having chosen his ground the sportsman proceeds to build his basha on the edge of the swamp. The Thamin in Manipur keeps absolutely to the swamps, except perhaps during the rutting season, when he may be met in the long grass at the foot of the hills. The shikari wakes you up at about 3-30, and you should have left your camp by 4-0, an hour before dawn. As soon as light appears the stag moves off into deep water, where he is very difficult to follow, so it is very necessary to get a view of him early. After a stag has been seen he should not be followed unless he is actually moving away from you or until he commences grazing. His senses of hearing and seeing are acute. As a rule one can approach him from behind high patches of grass, taking care to move only when he is unlikely to see you. I was fortunate in bagging two fairly good heads last season (though neither reached 50 inches) and the deformed one.



The deformed head shown in the photograph seems quite unique. One horn, brow-antler and beam, is complete whereas the other has only the brow-antler and this, instead of growing forwards and upwards, takes a vertical direction. It is a much thicker and longer brow-antler than the

other. There is no sign of a break from fighting or any other cause. When I shot this stag my shikari was extremely excited, telling me that the Manipuris say that in each variety of deer only one stag bears such a head, and any one who has one in his possession will be wealthy and healthy for the remainder of his life. I only hope this will prove true.

The measurements of this deformed head are :—

Left Horn : Beam $31\frac{1}{4}$ inches. Brow Antler 15 inches = $46\frac{1}{4}$ inches.

Right Horn : No Beam. Brow-Antler $18\frac{3}{4}$ inches.

The best head bagged last year was shot by a Jemadar of the Regiment, measuring :—

Left horn : 49 inches. Right Horn $53\frac{1}{4}$ inches.

Two other very good heads were shot by Colonel Tytler measuring over 52 inches and 53 inches respectively.

A. H. D. BARRON,
17th Infantry.

MANIPUR, 11th November 1911.

No. IV.—DO CHINKARA (*GAZELLA BENNETTI*) DRINK WATER ?

W. S. Burke, in his *Indian Field Shikar Book* writes concerning the Chinkara, "It is said never to drink." I have had very little experience with Chinkara, but on two occasions within the last year I have seen them coming to drink.

In the C. P. last December every afternoon from 4 p.m. to 5 p.m. about 12 Chinkara used to come and drink either singly or in pairs at a road-side tank. Last June I also observed them, both bucks and does drinking from a river, near which I had pitched my tent. I do not know whether you have already had correspondence on the subject, but it would be interesting to know if others have noticed this.

C. R. S. PITMAN, 2ND LT.,

ALIPORE, August 1911.

27th Punjabis.

No. V.—INDIAN BREEDS OF SHEEP.

I shall be much obliged if any member of the Society can procure for me a skull of a ram of the four-horned breeds of sheep which Col. Godwin Austen said (*cf.* Proc. Zoological Society, 1879, p. 802) are carefully preserved in Kishtwar. The only specimen which he brought home of this remarkable breed, was destroyed many years ago, and I can find no description, figure or specimen of this breed anywhere in England.

Four-horned sheep are known in many countries, and we have in England no less than 3 distinct breeds in which 4-horns are common though not universal in the male sex.

Also I should be glad if anyone can give exact information as to the race or aberration, of sheep in Nepal, in which the rams have the two horns united in one. These sheep have been imported more than once to England, and there are living ones now in the menagerie of the Duke of Bedford. But as no females have been seen, it has been suggested that the junction of the two short upright horns is artificially proceeded, by binding together the horns of the lamb when young.

Another sheep about which I can find no recent or exact information is the large coarse woolled breed used in Ladak for carrying salt. Though a great deal has been written both by shikaris and zoologists about the wild sheep of Asia, yet so far as I can learn no one has as yet made any serious attempt to describe or illustrate the domestic races, and there is little doubt that a careful study of them, would have great economic importance. The Karakul breed from Bokhara has now been introduced to the United States, with the idea of producing the fine curly skins which are imported at a high and increasing price, under the name of Persian lambskins. Might it not be possible to breed these successfully in parts of the North-West Himalayas, or does the character of the wool degenerate in other parts of Asia? On this important question we know next to nothing.

COLESBORNE, NR CHELTENHAM,

H. J. ELWES.

September 1911.

No. VI.—THE BANTING OR TSAING (*BOS SONDAICUS*).

Early in December 1910 I was fortunate enough to be marching through one of the uninhabited forest tracts of Upper Burma and after several days of moving camp halted in the middle of the forest for a day off. My camp was near a good stream and the hills along its banks are at certain times the haunt of tsaing (*Bos sondaicus*) so I thought it worth while to take a look round. I had an excellent old Burmese shikari with me and we left camp soon after seven and slowly walked up one of the spurs until we found a narrow winding game tract which we followed for a couple of miles. The grass was getting dry and the surface was hard and stony so I had on India rubber soled boots. Less than three miles from camp we came to a fork in the path and the old man hesitated for some time before taking the right hand path, a momentous decision as it chanced. We went on carefully looking out for tracts, myself in front and the two Burmans a little way behind. Within half a mile I suddenly spotted ten yards below the path a fine bull grazing among the scrubby trees and quite unconscious of an enemy's presence and was able without trouble to drop him in his tracks with a soft-nosed bullet behind the shoulder from a 500 high velocity rifle. He died almost at once and I thought it an excellent chance to return and

fetch my camera and was able to get the photo here reproduced after cutting away the scrub round him.



The length of the horns on the inside curve was 5 feet, distance from tip to tip $34\frac{1}{2}$ inches, widest inside 37 inches, and girth of horn round base 15 inches. He was accompanied by a smaller bull as is so often the way with tsaing, and this one bolted at the shot giving me a glimpse of him through the jungle. There was great glee among the Burmans of course at such a fine haul of meat, and I was much amused at hearing a calculation being made of the number of cart yoke straps his hide would yield. Burmese cartmen usually fasten the yokes of bullockcarts to the holes by thongs. A long and gory procession descended from the ridge to the camp during the afternoon bearing blocks and strings of meat of all kinds and shapes and pemmican manufacture was soon in full swing.

DEHRA DUN, November 1911.

A. RODGERS.

NO. VII.—THE COLOURATION OF TIGERS.

When shooting last hot weather in the Central Provinces, I bagged two tigers at places quite 20 miles apart, and the difference in their colour was very marked. The first whose colour was very dark had a reputation for

keeping to the jungle ; he was cunning and did not worry the villagers by raiding their cattle, although he was often heard at night. His mate was of the same dark colour. I shot her.

In the next case I again shot the tigress ; but this time the first news I heard of the tigress and her mate was that they were both very bad cattle marauders. The colour of the one I shot was a very pale yellow. When reading Col. Fytche's book on Big Game I noticed that he remarks that the really bad cattle-stealing tigers were always reputed to have far paler skins than their less notorious brethren. I wonder if any of your correspondents have ever come across this, when out on shikar.

This second tiger had done great damage to cattle during the short time that I was in the shooting-block.

ALIPORE, CALCUTTA,
13th November 1911.

C. R. S. PITMAN,
27th Punjabis.

NO. VIII.—A DEFORMED HEAD OF THE FOUR-HORNED ANTELOPE.

On the 18 June 1911, I shot what appeared to me to be quite a good Four-horned Antelope buck. He was a 100 yards away when I got him. On approaching I found that his right rear horn was missing. It had either never grown at all or it had been knocked off very early in his life. The actual measurements were as follows :—

Length of right rear horn	..	..	None.
Length of left rear horn	..	..	$3\frac{3}{8}$ inches.
Length of front right horn	..	..	$1\frac{7}{8}$ inches.
Length of front left horn	..	..	$1\frac{7}{8}$ inches.
Girth of rear horn	..	..	2 inches.
Girth of front horns	..	..	$2\frac{1}{8}$ inches.
Tip to tip: rear horns	..	..	....
Tip to tip: front horns..	..	..	$\frac{3}{4}$ inches.

ALIPORE, CALCUTTA,
13th November 1911.

C. R. S. PITMAN,
27th Punjabis.

NO. IX.—THE PINTAIL DUCK (*DAFILA ACUTA*) SHOT IN SEPTEMBER.

When flight shooting in Kashmir on 21st September, I bagged a Pintail drake which was in either immature or eclipse plumage. The earliest recorded date hitherto for this duck in India is October.

H. A. F. MAGRATH, MAJOR.

KASHMIR, 1911.

No. X.—OCCURRENCE OF EUROPEAN STRIATED SWALLOW
(*HIRUNDO RUFULA*), IN KANGRA.

At the end of May I was marching along the road from Palumpur to the Bhuhu Pass in Kangra district, when on May 31st between Baijnath and Dhelu I met with a species of Striated Swallow—to quote from my note book, “another swallow was common—some Striated species, and I found three of their nests, built under ledges of rock. The first contained 4 white eggs, but they were nearly hatching and I could not save one. The nests are of mud and are of the shape of a half a cognac flask with long neck (section taken lengthwise) fastened underneath ledges. They are lined with a little dry grass and feathers. The second nest contained a fully feathered young Swift (*Cypselus affinis*). The third was ready for eggs.” Finding the nests, I shot a bird for identification (skin register 407, ♂ 31. V. 1910, Dhelu, Maudi N. S.) which remained unnamed in my collection for some time. This skin was recently sent to England with others to Dr. C. B. Tichurst, M.B.O.U., who had it named by Dr. Hartert. He stated that it was undoubtedly *H. daurica sculli* (Seebohm). As this sub-species apparently corresponds to *Fauna of B. I.* No. 824, *H. rufula*, this note may be of interest. If observers along the Western Himalayas were to look out for this species, it would perhaps prove to be a well distributed breeding species.

H. WHISTLER,
Indian Police.

FEROZEPUR, January 1912.

No. XI.—NIDIFICATION OF THE TWEEDDALE SCIMITAR
BABBLER (*POMATORHINUS NUHALIS*).

On the 30th October I found a nest containing 2 fresh eggs and although I did not actually obtain the parent bird, I am quite sure it belonged to the Scimitar Babbler common in the locality—*P. nuchalis*. The eggs were pure white and glossy and measured $.93 \times .7$. The nest was placed in a bamboo clump about 3 ft. from the ground and egg-shaped in form, the aperture being much closer to the top than the bottom; the lower part of the nest was a fairly deep cup. It was carefully lined inside with dried grass and packed exteriorly with dried bamboo leaves, so that the nest on first sight looked like a collection of leaves.

I think the 30th of October an unusual time of year for any of the babblers to be laying.

J. P. COOK.

THAYETMYO, 30th November 1911.

No. XII.—THE PARADISE FLYCATCHER (*TERPSIPHONE PARADISI*).

It is a curious thing that hitherto, as far as I am aware, the statement in the *Fauna*, Vol. II., p. 45, regarding members of the genus *Terpsiphone* "never descending to the ground," and their notes being "very harsh," has remained uncontradicted. So long ago as 6 years I noted that the song of the Paradise Flycatcher was in keeping with its appearance, and I regret that in notes on this species subsequently published I have omitted to correct the misstatement in the *Fauna*.

The song of *T. paradisi* is a series of sweet liquid notes descending the scale, then running up at the end and repeated 3 or 4 times. Although short it cannot fail to give pleasure to all who hear it, and can rank as a fine bird song. In Kashmir the song is continued up to the end of September if not later. I have seen this flycatcher descend to the ground on three occasions at least.

I trust that this belated note will serve to vindicate the character of *T. paradisi* at any rate.

H. A. F. MAGRATH, MAJOR.

KASHMIR, September 1911.

No. XIII.—THE CRAG MARTIN (*PTYONOPROGNE RUPESTRIS*).

The fact that the Crag Martin is subject to a seasonal movement along the Himalayas does not appear to have been noticed by Oates in the *Fauna*, Birds, Vol. II, p. 274, but there is no doubt that it is so.

Jerdon speaks of it as a "bird of passage," and writing more than 40 years ago Hume remarked that "on many of the higher hills south of the snowy range, it seems to a great extent to be a permanent resident, not at any rate migrating *en masse* from the country, but, as a rule, only retreating lower down the valleys in the cold weather; some few, however, during the latter season being met with in the higher hills of Central India and Rajputana. On the Neilgherries there appears to be a permanent resident colony." (Lahore to Yarkand, p. 177). As regards Chitral it is said to be a common summer visitor, appearing about the middle of April, and remaining till October. It breeds at all elevations there from 4,500 feet up to 13,000 feet. (J. B. N. H. S., Vols. XVI and XIX, pp. 55 and 914 respectively).

In the neighbourhood of Simla (7,000 feet), these Martins are usually to be seen in immense flocks about the third week in March (earliest date 19th March), and then again about the middle of October. On their arrival here, the Jungle Crows commit great depredations amongst them, and literally speaking gorge themselves on these helpless birds. I should think that very large numbers of them must come to grief in this way.

Excluding the few birds, which find their way down to the hilly districts in the plains, during the cold weather, it would be interesting to know the *lowest* elevation at which the majority remain, at that season, in the Himalayas.

Since Hume's time several Oölogists have taken the eggs of this bird, but none of them have put on record an exact and detailed description (*e. g.*, length and breadth, texture of surface, etc.) of the specimens.

The time of breeding of this species should be April to June, and Quetta should be included in its habitat. (J. B. N. H. S. Vol. XVII, pp. 831-32).

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 23rd October 1911.

NO. XIV.—EXTENSION OF THE HABITAT OF THE COMMON KINGFISHER (*ALCEDO ISPIDA*).

In the "*Fauna*," Birds, Vol. III, p. 123, Blanford remarks that *Alcedo ispida*, Linneus, "is only wanting in the Himalayas, where it is rarely met with far above the base of the mountains, etc." It is, therefore, of interest to record that on the 15th May 1910, I procured a specimen, an adult male with testes slightly enlarged, in Keonthal territory, not more than 3 miles from Simla, at an elevation of about 5,600 feet. On the 26th April 1911 I again saw another bird in this locality.

It is undoubtedly a rare species in these parts.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 23rd October 1911.

NO. XV.—NOTE ON THE COMMON KINGFISHER (*ALCEDO ISPIDA*).

It may be of interest to record that on the 23rd of September I saw a common kingfisher "take" a frog quite $1\frac{1}{2}$ inches long in the body, and after hammering the same against its perch disappear with it into a hole in the river bank near by and almost immediately emerge with its bill empty. When conveyed to the hole the frog was carried longitudinally between the mandibles, its head being beyond the ends and its legs dangling on either side of the gape.

Now here were two remarkable occurrences. Firstly, this kingfisher taking a frog (and a comparatively big one) and from the Jhelum river swarming with small frogs, and secondly, considering the time of year, conveying it to a nest hole. The latter operation at once gives rise to the question what was in that hole? It can, I think, only be inferred that there was a mate sitting on eggs, for young in the nest would hardly be fed with such a mouthful as the frog in question. Now and again all through

the month of September I noticed some of these kingfishers fly to holes with their captures and I have concluded that in Kashmir, breeding operations are continued up to the end of September.

As is well known this little kingfisher abounds in Kashmir. It is rather the rule than the exception to have at least one fishing from one's houseboat.

When perched for fishing the tail is depressed, except when it, the head and neck, are elevated with a short of oscillating motion. If the perch however is on the ground on top of the river bank, as it sometimes is, the tail is then kept elevated.

Occasionally this bird dives from the wing exactly after the manner of *Ceryle varia*. The poise and hover sometimes is quite as much as 12 or 15 feet.

H. A. F. MAGRATH, MAJOR.

KASHMIR, 1911.

NO. XVI.—THE NOTES OF PALLAS' FISHING EAGLE (*HALIAËTUS LEUCORYPHUS*) AND SOME WATER BIRDS.

The "*Fauna's*" remarks on the note of Pallas' Fishing Eagle are "has a loud shrieking call note." As this description is rather vague and would hardly serve to identify the bird in localities where other raptorial birds with loud notes were common I would like to supplement it by observations of my own on this eagle. The note to my ear is a striking one. When heard in the distance it is not unlike that of the Herring Gull (*Larus argentatus*) when closer it runs off at the climax into a series of repetitions which bear a strong resemblance to the creaking which accompanies the working of block tackle. Whenever I heard the latter notes they reminded me greatly of the sounds one hears when a fishing fleet has come into harbour and the boats are lowering away and stowing sails. When very close a preliminary low croaking note is heard and the note last described sounds exactly like the clucking of a hen to her chickens only repeated with rhythm.

Several times I noticed that this eagle was much harried by a smaller one which, from the way it soared in small circles with wings above the horizontal, occasionally hovered, and from its long tail, I came to the conclusion was the Short-toed Eagle (*Circaëtus gallicus*). The mere approach of this latter when the former was perched in a tree was enough to start the "block tackle" working.

The Little Ringed Plover (*Ægialitis dubia*) has a dissyllabic note but one which at once distinguishes it from *Æ. hiaticula* with which it might easily be confounded even when observed at close quarters and through glasses, though the latter is, of course, a rare bird in India. This note is

well rendered by the syllables "Tee-a," the note of *Æ. hiaticula* being a pretty plaintive "Tlü-eh."

I have never seen in print, what must have struck many observers, that the ordinary call notes of the Greenshank (*Totanus glottis*) and the Redshank (*T. calidus*) are indistinguishable. Yet such is the case I maintain. If there be any man who blindfolded could tell which is which from the notes then all I can say is that he has a wonderful ear. To the birds themselves, of course, their notes must be distinct. But the difference, whatever it is, can only lie in a very slight change of pitch and in volume of sound, the Greenshank, as being the larger bird, probably having the louder note. In the case of both species the note is monosyllabic and is ordinarily well expressed in writing by the syllable "Tyü" quickly repeated twice. Sometimes it is thrice repeated and I am inclined to think this is more often the case with the Greenshank than the Redshank. When rising alarmed the above syllable is rapidly repeated several times and I have heard it so repeated as many as 12 or 15 times in this case the species being the Greenshank.

The note of the Wood Sandpiper (*T. glareola*) is disyllabic and resembles the syllables "Tchikkit."

The Green Sandpiper (*T. ocropus*) has a monosyllabic note like "Twit" repeated 2 or 3 times when taking to flight.

A note of the Little Indian Grebe or Dabchick (*Podiceps albipennis*) which is peculiar, is a shrill prolonged whirring sound running down the scale. It may be likened in fact to a prolonged shrill whinny.

H. A. F. MAGRATH, MAJOR.

KASHMIR, 1911.

NO. XVII.—IMMATURE PLUMAGE OF LAMMERGAYER (*GYPAËTUS BARBATUS*).

When shooting in the neighbourhood of Kalabagh on the River Indus in the early part of the year I was struck by the abundance of Lammergayers and asked the Malik of Kalabagh to try and get me a clutch of their eggs. This he very kindly promised to do and set his shikaris on to the task with the result that two rock eyries were found. About the 1st March one of the nests, which could be examined with glasses from a neighbouring rock was seen to contain eggs, but on attempting to take them the Malik's men found that even with ropes they could not get to the nest. The other nest was reached and found to contain one nestling which was brought to me in Rawalpindi on March 3rd. Lammergayers are not often seen in captivity; it may be worth while to note the bird's growth of plumage.

When received it was covered with thick down of a dirty brownish grey tint, the sides of the head being a darker and browner colour. Tail and wing quills of a dark brown colour were sprouting, as well as wing coverts of dark, and light brown. The scapulars were well grown, forming two conspicuous patches of dark brown. On the sinciput was a rough patch of dark feathers, and a few similar feathers were apparent on the sides of the breast. On the lower back was a very small patch of light and dark brown feathers. The tarsus was well covered with down. The soft parts were as follows:—iris, brown; *bill* olive grey with a black tip, the base and gape being plumbeous blue. Eyelids and bare shelves above the eyes plumbeous blue; feet, lead flesh; claws, black.

The bird was about the size of a small goose and rather noisy, giving vent to a curious shrill squeak; it was very voracious.

The scapulars were the first feathers to attain their full growth, followed by the other feathers more slowly until about the 19th April, when I again described the bird, it was almost completely feathered.

On that date the head was sparsely covered with pointed black feathers which growing more thickly on the crown formed a conspicuous patch terminating in a point on the sinciput; from this patch a distinct line of feathers ran down each side of the head to the ear coverts. The bristles on the chin and pores were very prominent. The entire neck was covered with dirty pepper-and-salt coloured down which extended in a darker tint to the patch of feathers on the crown; the chin and upper throat were very sparsely feathered and down the line of the throat a few blackish feathers tipped with white were mingled with the down. The scapulars were large and prominent of a glossy black colour with glistening shafts and lighter centres; the mantle was similarly coloured but most of the feathers, especially towards the sides, were tipped with dirty white, giving the effect of a rough chevron. The lower back and rump were a mixture of grey, dirty white, and smoky black. The quills of the wings and tail were black with a slight purplish gloss, and the greater wing coverts were similar but brown. The remaining coverts were smoky black with light shafts, marked in a few places with white. The under parts including the thighs and underwing coverts were a mixture of smoky brown and white with the exception of the feathers on the lower edge of the crop which were smoky brown alone. The tarsi were feathered except posteriorly. Iris, clear hazel; sclerotic membrane reddish yellow. Nictitating membrane whitish. Feet greenish white with black claws.

The bird's plumage now remained the same until the beginning of July when black lanceolate feathers began to struggle through the down on the back of the neck, and by the middle of September that portion was thickly clothed and the plumage complete.

The bird was most noisy, uttering a squeaking note and also on occasion

a kind of quack; although it allowed me to handle it freely it would chase any of the servants to which it took a dislike. Here my notes end, as by the kindness of our Honorary Secretary arrangements were made to ship the bird to England and it sailed on October 9th, in the "City of Athens," en route for Regents Park.

FEROZEPORE, October 1911.

H. WHISTLER, I. P.

No. XVIII.—OCCURRENCE OF THE GOSHAWK (*ASTUR PALUMBARIUS*) IN SIND.

On the 10th of this month two men brought me an immature Goshawk, *Astur palumbarius*. She, for it is a female, is a particularly fine specimen and, according to the men who caught her, was captured while killing their tame partridge not far from Karachi. I have no doubt that the bird is a wild specimen and not an escaped one as if the latter she would have the usual marks on her eyelids of the thread used to sew them up, and besides it is full early for a purchased bird to be brought as far south as this. I think, therefore, that this may be taken as an instance of the occurrence of the Goshawk in Sind.

RAYMOND W. COOPER.

KARACHI, 12th October 1911.

No. XIX.—EXTENSION OF THE HABITAT OF THE BRAHMINY KITE (*HALIASTUR INDUS*).

In the *Fauna*, Birds, Vol. III., p. 373, Blanford makes no mention of the fact that *Haliastur indus* (Bodd) is found in the N.-W. Himalayas, but it is true nevertheless that this species ascends these mountains to at least 5,500 feet, and is apparently a permanent resident here. My friend, Mr. Alec. Jones, was the first to draw my attention to this, and I give below the dates and localities, in the neighbourhood of Simla, where this kite has been observed during the last three years or so.

- (a) A single bird seen on the 4th July 1909 near the Keonthal stream, between Chail and Simla.
- (b) • A single bird seen again on the 24th June 1910 near the stream facing the Keonthal Raja's Palace.
- (c) Several birds, both adults and young, seen after this in the vicinity of the septic tanks between Simla and Tara Devi. The tanks referred to are not more than 3 miles from Simla in a S. direction. On the 20th August 1911, I procured a specimen (a young female) in this locality and could have shot several more. I have no doubt that they breed in the neighbourhood and I hope to take the eggs next year.

It seems curious that Hume makes no mention of this bird being found so close to Simla, and if it had occurred here in his time, it is hardly possible that it would have escaped his notice. What seems very probable is that it is only within very recent times that this species has extended its range so high up.

Stoliczka, in his "Ornithological observations in the Sutlej Valley" (J. A. S. B., Vol. XXXVII, pt. ii, p. 16), says that this kite is only an occasional visitant to the lower hills; he observed it between Suket and Mandi on marshy ground, but not further in the interior. He adds that it is sometimes seen in the Kashmir Valley above Srinugger.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 23rd October 1911.

No. XX.—THE PAINTED SNIPE (*ROSTRATULA CAPENSIS*).

I see that in your publication of 20th May 1911, under the title of Game Birds of India, Burma and Ceylon, you say that "there is, I think, little doubt * * * that the female Painted Snipe is polyandrous."

This agrees entirely with what I noticed this year at the end of May, round a large tank in the Central Provinces.

On 25th May 1911 I noticed several Painted Snipe get up from a patch of lilies by the edge of the tank. I then put two off their nests, both of which I shot and which proved to be males. Each nest contained four eggs and incubation had started; it is however worth noting that the lily patch where one would invariably flush the birds was quite close to the strip of ground where the two nests were found; so the females were always near at hand. Later in the day I found a nest with one egg in it on a small island in the tank. It also was very curious that the birds when disturbed simply flew backwards and forwards between this place and the lily patch. In all I counted 16, and out of them I shot 9; 5 of these were males and 4 females; there were however no more females, as the difference in sexes is very noticeable when on the wing. All the birds I shot were old ones. The nest in each case was in a hollow made by the hoof of some animal; in only one instance had a few dry rushes been made use of as a lining.

In all cases the nests were on dry ground among broken reeds and close to water. Length of eggs: just under 1.49"; beautifully marked and very glossy. In December 1910, I noticed some Painted Snipe near a small tank. I did not realize at the time that they were probably breeding and always saw 3. On the 19th I shot all three and after that saw no more; they proved to be two old males and one old female.

In Peshawar, where they are rare, I shot a male in September 1910, and in January 1910 one of the Majors in my Regiment shot a male when out after Snipe on a big Jheel; both old ones.

C. R. S. PITMAN, 2ND LIEUT.,

27th Punjabis.

ALIPORE, August 1911.

No. XXI.—PAINTED SNIPE (*ROSTRATULA CAPENSIS*) IN
LARGE NUMBERS.

In connection with the article on the Painted Snipe in Vol. XX, No. 4, of the Society's Journal, it may interest you to know that while shooting over rice-fields near Thana on Sunday last I put up fifteen Painters in a single field, and in the course of the morning saw between fifteen and twenty couple of these birds. When shooting in the same locality I have often found Painters in greater numbers than pucca snipe, and this was the case again on Sunday when my bag included $11\frac{1}{2}$ couple of Painters, 7 couple of Snipe and two couple of Jack.

These experiences hardly agree with the statement in the Journal that "nowhere is the Painted Snipe ever found in such vast numbers as is the Common Snipe," and it may be that other local *shikarees* have found the same to be the case.

On page 905 of the same Volume it is stated that "the Jack Snipe is not nearly so common as either the Pintail or Fantail," whereas when shooting at various places on this side of the Ghats, I have always found the Jack to be more common than the Pintail.

Bags made in the locality of Bombay are rarely enough to justify their inclusion in sporting records, but they are not without interest, as the comparative numbers and distribution of the different varieties of Snipe do not agree, in my small experience, with those given in the Journal.

A. H. KINGSTON.

BOMBAY, 31st October 1911.

No. XXII.—RECORD OF SNIPE SHOT AT HMINELONGYEE, IN
THE CHIENGMAI DISTRICT OF SIAM, 18°15' NORTH
LAT., 98° EAST LONG., FROM 1905 TO 1910.

I enclose a record of snipe shot in Hminelongyee, a district in Siam, and about 25 miles across the border from Burmah, 18°15' North Lat., 98° Long., for a period of six years, which may be of interest.

The months of May, June and July did not produce much. October, November and December show small bags; this was not due to the scarcity of snipe, but rather to the want of time to shoot them.

I regret that no record was kept of the different species.

Month.	1905.	1906.	1907.	1908.	1909.	1910.	Total.
January	9	31	62	43	4	92	241
February	52	9	6	53	17	69	206
March	24	21	63	32	16	7	163
April	15	39	9	24	14	16	117
May	1	..	..	..	..	..	1
June .. ..	..	..	..	..	..	..	..
July .. ..	..	..	..	..	..	..	..
August	37	..	44	42	14	12	149
September	48	2	64	61	..	179	354
October	49	..	..	..	13	20	82
November	2	..	..	..	..	..	2
December	4	..	..	21	..	19	44
Total ..	241	102	248	276	78	414	1,359

D. L. KEDDIE.

MONG PAI, PAPUN, BURMA,
9th September 1911.

NO. XXIII.—NOTES ON SOME OF THE BIRD LIFE AT THANDOUNG.

The small hill-station of Thandoung has only lately come to the fore as a sanatorium for Europeans. It is situated on the Karen Hill, 28 miles east of Tounghoo, the elevation being about 4,000 feet. The country is very hilly and densely wooded, making it a difficult matter to collect bird specimens, but from an ornithological point of view it is very interesting, bird-life being plentiful and varied, notwithstanding the fact that running water is scarce in the neighbourhood, probably due to the great deforestation by Taung-yah cutters in former years, very little of the virgin forest being left.

Within recent years the Forest Department have put a large area under reservation, the immediate consequence being that a dense secondary growth chiefly consisting of a thin spikeless variety of bamboo, has sprung up.

This bamboo has an aggravating habit of throwing out its stems at all angles, and they so intertwine one with another and bend over so close to the ground that, except where paths have been cut, the greater part of the forest is almost impenetrable except on one's hands and knees.

My visit to Thandoung extended from the 1st to end of April, and I was fortunate in meeting a congenial companion, the Hon'ble Mr. Justice Robinson, an enthusiastic egg-collector. I have since repented that from the commencement of my visit I did not also take up egg-collecting. The following is a list of birds noticed and procured—a very meagre list I am afraid—but I was much handicapped by the thickness of the forest, and I can only hope that my list may be much added to by those interested in birds who may pay Thandoung a visit :—

4. *Corvus macrorhynchus*—The Jungle Crow.

8. *Corvus insolens*—The Burmese House Crow.—Noticed only round dwellings and camping grounds.

14. *Cissa chinensis*—The Green Magpie.—This bird was far from rare, but its raucous call was far oftener heard than the bird was seen; it is a great skulker and very wary. Robinson shot for me the only specimen I obtained. Karens brought me 2 well-grown nestlings on April 29th, which reared and they became very tame.

16. *Dendrocitta rufa*—The Indian Tree-pie.

18. *Dendrocitta himalayensis*—The Himalayan Tree-pie.—Both these birds were represented at Thandoung. The day before I left, I noticed a pair of the latter which appeared to be nesting, but I had not time to make a hunt for the nest.

41. *Machlolophus spilonotus*—The Black-spotted Yellow Tit.—This was a very common little bird at Thandoung. I noticed a large party in the middle of April which appeared to be a family party.

64. *Dryonastes chinensis*—The Black-throated Laughing-Thrush.—I did not procure this species at Thandoung itself, but Karens brought me a specimen from the lower hills, an elevation of about 2,500 feet.

70. *Garrulax belangeri*—Burmese White-crested Laughing-Thrush.—This bird was not very common on the top of the hill, much more plentiful lower down the Ghaut.

72. *Garrulax pectoralis*—The Black-gorgeted Laughing-Thrush.—Almost as common at Thandoung as elsewhere, but rather local. I saw well grown young birds just able to fly on April 23rd and so they must have commenced nesting rather exceptionally early.

86a. *Trochalopteron ramsayi*—I only found this bird on two occasions and each time they were solitary, no other birds of their species being near. I shot both birds seen and expected them to be females with a nest, but they both turned out to be males. *T. ramsayi* has a very pretty

whistling note, and it was this which betrayed its presence to me in very thick brushwood.

117. *Pomatorhinus nuchalis*—Tweeddale's Scimitar Babbler.—This bird was not often observed, but it may have been more common than appeared. As being such a great skulker, it was difficult to find in the dense undergrowth. Robinson obtained its nest with fresh eggs about the middle of April and shot the parent bird which he presented to me, being the only specimen I obtained.

129a. *Pomatorhinus imberbis*—A very common bird at Thandoung. Its noisy call was to be heard in every thicket. Common as it was, neither Robinson nor myself managed to find its nest. Two specimens shot.

145. *Pellorneum subochraceum*—Burmese Spotted Babbler.—I only saw one bird of this species which I secured. I would probably have seen more had I not been handicapped by the thickness of the jungle. Karens brought 3 eggs on April 29th which Major Harrington identified as belonging to this species.

186. *Turdinulus roberti*—Robert's Babbler.—As such I identified my specimen; but Major Harrington, to whom I sent it, thinks it is *Turdinulus davisoni*, but he is sending the skin home to have the identification verified.

187. *Myiophoneus temminckii*—The Himalayan Whistling-Thrush, or

188. The Burmese Whistling-Thrush.—One or other of these birds I noticed, but as I was unable to procure a specimen, I cannot say which.

190. *Larvora cyanea*—The Siberian Blue Chat.—A specimen was brought to me from the lower hills where it had been snared by Karens with bird-lime.

218. *Staphidia striata*—Tickell's Staphidia.—Both Mr. Robinson and myself found nests of this bird. I found 7, but it was some time before we could make sure of the identification of the eggs. Eventually Robinson shot the parent bird off the nest, and I caught a bird on its nest. Prior to this I had not noticed the staphidia, and it is a bird which can be easily overlooked, its habits resemble those of Tits or White eyes—hunting in parties amongst the leaves and boughs of forest trees and keeping up a continual twittering the while. After having once observed the bird, I found it to be quite common. I have already described the nest and eggs of this bird in the Journal. The birds seem to breed chiefly in April and several nests were to be found along every road with suitable bands. I found all my nests between the 18th and 30th of April, and all contained fresh eggs. One completed nest I found on the 23rd and by the 30th the full clutch which appears to be 3 only was laid. None of the nests found contained more than 3 eggs.

228. *Zosterops simplex*—Swinhoe's White-eye.—A common little bird. There may be other species of White-eye at Thandoung but such small birds were difficult to see in the thick forest.

249. *Chloropsis hardwickii*—The orange-breasted Chloropsis.—I only procured one specimen of this bird, the only one seen.

270. *Hypsipetes concolor*—Burmese Black Bulbul.—A common bird. It appeared to be nesting in April but I could find no nests.

280. *Molpastes nigripileus*—The Tenasserim Red-vented Bulbul.—This bird was observed on several occasions but at Thandoung itself it was by no means very plentiful.

287. *Xanthivus flavescens*—Blyth's Bulbul.—An extremely common bird. This bird and the next being the commonest birds in the settlement. I expected to find quite a number of nests. I found many old nests which I think belonged to this species but only one with eggs.

288. *Otocompsa emeria*—The Bengal Red-whiskered Bulbul.—As common as Blyth's bulbul, but I only found 2 nests with eggs. The last nest I found containing one egg only on the 26th of April, but before I left on the 30th the full clutch of 3 was laid.

325. *Sitta frontalis*—The Velvet-fronted Blue Nuthatch.—Common.

339. *Bhringa remifer*—The Lesser Racket-tailed Drongo. A nest I found on April 29th, containing 3 fledgings almost ready to leave the nest, I think belonged to this species. The nest was built in the fork of a dead bamboo which had been partially broken and was hanging over from midway up the stem.

340. *Dissemurus paradiseus*—The Larger Racket-tailed Drongo.—Common. Robinson found a nest containing hard set eggs on about April 18th as far as I can remember.

423. *Acanthopneuste plumbeitarsus*—Middendorff's Willow-Warbler.—A specimen of this bird was brought me by Karens from the lower hills at an elevation of about 2,500 feet. I noticed on several occasions larger parties of a small warbler, hunting about in the brush-wood which I believed to belong to this species, but the undergrowth was so dense that I did not manage to procure a specimen.

430. *Acanthopneuste davisoni*—The Tenasserim White-tailed Willow-Warbler.—I only procured one specimen of this bird and that was a parent bird from its nest on the 19th of April. The nest contained 3 pure white top-shaped eggs measuring .47 by .55. The nest was globular in shape, slightly oblong with the entrance on the side. The nest was beautifully concealed, being surrounded by leaves and grasses used in its construction, and had I not noticed the bird flying off I would not have discovered the nest.

461. *Suya supercilialis*—Anderson's Hill Warbler.—This was the only Suya I noticed, it frequented the grassy knolls. I procured one nest containing 4 fresh eggs on the 25th of April. The nest was purse-shaped and built between the stems of a small bush close to the ground and lined with fine grass. The eggs were a dull greenish white in colour with minute

brown specks sparingly distributed over the egg except at the larger end at the top of which they formed a zone. They measured $\cdot 6 \times \cdot 49$.

486. *Tephrodornis pelvicus*—Nepal Wood-Shrike.—One specimen obtained, several others seen.

491. *Pericrocotus fraterculus*—Burmese Scarlet Minivet.—Only one specimen of this beautiful bird obtained, other birds were seen but on rare occasions.

539. Mynas and Starlings.—The White-winged Myna.—I have no notes of any seen except that I noticed a bird which I took to be *Sturma nemoricola*.

562. *Siphia albicilla*—The Eastern Red-breasted Flycatcher.—Seen on several occasions and I obtained 2 specimens, a male and female.

569. *Cyornis melanoleucus*—The Little Pied Flycatcher.—Only once seen and obtained.

575. *Cyornis rubeculoides*—The Blue-throated Flycatcher.—Only saw one bird which I procured.

579. *Steparola melanops*—The Verditer's Fly-catcher.—This bird was nesting in April in the banks of road cuttings and Robinson and I found many nests. I took a clutch of 4, one of 3 and an egg from a clutch of 4 between 25th and 30th. The nests were built of moss and lined with fern stems and with 2 exceptions were built into crevices in the banks. The exceptions were 2 nests I found placed about 18" down a small tunneled hole, just large enough for the bird to enter by, reminding one of a Bee-eater's nest-holes, by which bird it had probably been originally made.

592. *Culicicapa ceylonensis*—The Grey-headed Flycatcher.—One specimen obtained. Only noticed 2 or 3 times.

601. *Hypothymis azurea*—The Indian Black-naped Flycatcher.—One specimen brought to me by Karens from lower hills.

604. *Rhipidura albifrontata*—The White-browed Fantail Flycatcher.

605. *R. albicollis*—The White-throated Fantail Flycatcher.—Both species were represented at Thandoung, the latter being quite common. I found a nest belonging to the latter bird on the 21st of April, containing 3 young birds. The nest was cone-shaped and beautifully, neatly and compactly constructed being plastered all over with cobwebs and lined with very fine grass. It was built in the fork of a dry slender bamboo branch which was partially broken midway up and hanging suspended from lower stem.

608. *Pratincola caprata*—Common Pied Bush-Chat.—I noticed 2 or 3 pairs round the Hotel. They were apparently breeding, but I found no nests.

634. *Henicurus leschenaulti*—Leschenault's Forktail.—I had very bad luck in not being able to procure this bird's eggs. On two successive days I noticed a pair of birds in a little wooded swamp which I made cer-

tain had a nest but I could not find it. Eventually as I wanted a specimen I shot one of them, which proved to be the female. In her oviduct I found an unformed egg. Shortly after shooting the bird I found the nest nearly completed. It was built into a mossy bank and the exterior of the nest being composed of moss it was difficult to distinguish from its surroundings. It was lined with fine grass and fern stems.

680. *Merula obscura*—The Dark Ouzel.—Only one specimen obtained by Robinson.

690. *Petrophila erythogastra*—The Chestnut-bellied Rock Thrush.—A solitary bird seen on several occasions round the Hotel at the beginning of April, and now I come to think of it, it had probably a nest near by but at that time I had unfortunately not begun to look for nests.

706. *Cochoa purpurea*—The Purple Thrush.—Only one specimen seen, which was procured.

726. *Munia atricapilla*—The Chestnut-bellied Munia.—Saw a party of munias I took to belong to this species, beside a swampy stream.

735. *Uroloncha punctulata*—The Spotted Munia.—Common, and found many old nests but no new ones in April. They probably nest later on in the rains.

761. *Carpodacus erythrinus*—The Common Rose-Finch.—One specimen brought to me from the lower hills.

801. *Emberiza rutila*—The Chestnut Bunting.—One specimen obtained at beginning of April.

841. *Anthus maculatus*—The Indian Tree-Pipit.—Seen everywhere along the roads. Only one specimen obtained.

907. *Arachnothera aurata*—The Smaller Streaked Spider-hunter.—One specimen obtained.

909. *A. longirostris*—The Little Spider-hunter.—Seen on several occasions.

Flower-peckers.—The twittering of these little birds I frequently heard, but owing to the density of the forest it was very difficult to observe such small birds and I did not shoot any.

955. *Chrysophlegma flavinucha*—The Large Yellow-naped Woodpecker.—This is the only species of the larger Woodpeckers I obtained. All the large species were conspicuously uncommon and very wary, also the density of the forest was a great hindrance in following up the birds.

968. *Dendrocopus atratus*—The Stripe-breasted Pied Woodpecker.—Common. I obtained two specimens, a male and a female.

975. *Iyngipicus canicapillus*—The Burmese Pigmy Woodpecker.—Common; a male and a female obtained.

1012. *Cyanops asiatica*—The Blue-throated Barbet.—I did not see this species at Thandoung itself, but a specimen was brought to me from the lower hills.

1018. *Cyanops ramsayi*—Ramsay's Golden-throated Barbet.—Very common indeed, and its aggravating monotonous call was to be heard everywhere.

1027. *Merops philippinus*—The Blue-tailed Bee-eater.—These birds seem to breed early at Thandoung. I dug into two nests in the banks of roads during middle of April, one contained very hard set eggs and the other young birds, and I did not wish to disturb any more nesting holes on the chance of finding fresh eggs. I was glad to see that the parent of the young birds in the hole I dug into continued to tend her young and by the time I left, the nestlings were flourishing and nearly ready to leave the nest, although lying quite exposed.

1031. *Nyctiornis athertoni*—The Blue-bearded Bee-eater.—I am almost sure I saw this bird on one occasion in heavy forest, but did not manage to secure it.

1051. *Dichoceros bicornis*—The Great Hornbill.—Seen occasionally at Thandoung, but commoner a little lower down the hills.

1067. *Upupa indica*—The Indian Hoopoe.—Saw several, and one bird flying with a grub in its mouth and apparently on its way to nest.

1101. *Harpactes erythrocephalus*—The Red-headed Trogon.—Seen on several occasions.

1123. *Rhopodytes tristis*—The Large Green-billed Malkoha.—One specimen shot; not very common at Thandoung.

Paraquets were so scarce that I do not remember noticing any, but a specimen of the Indian Loricet, *Loriculus vernalis*, was brought to me from the lower hills.

Owls and Nightjars.—None seen or heard.

1209. *Lophotriorchis kieneri*—The Rufous-bellied Hawk-Eagle.—I have already recorded in the Journal the obtaining of this species at Thandoung. I believe this bird has not hitherto been obtained in Burma Proper. I shot it in heavy forest in the act of carrying off a green pigeon.

1251. *Baza lophotes*—The Black-crested Baza.—I noticed a Black-backed Hawk-Eagle flying through the forest on one occasion which I am pretty confident was above species, but it was too wary to let me approach within shooting range.

On the summit of a hill known as Thandoung Gyi, I shot a falcon which I believe was the Shahin Falcon, *Falco peregrinator*, but it fell down the hillside into heavy forest, in which I was unable to find it.

1282. *Sphenocercus apiccauda*—The Pin-tailed Green Pigeon.—Fairly common, but I did not manage to shoot any birds, the commonest Green Pigeon, of which I shot several, was the Kokla Green Pigeon, *Sphenocercus sphenurus*.

1287. *Ducula griseicapilla*.—The Grey-headed Imperial Pigeon.—Fairly

common but very wary. I did not succeed in shooting any myself, but one of the visitors at the Hotel shot one.

1291. *Chalcophaps indica*—The Bronze-winged Dove.—Once seen and shot, but could not be found in the thick forest into which it had fallen.

1311. *Enopopelia tranquebarica*—The Red Turtle-Dove.—Occasionally seen on the roads. Two shot.

1312. *Macropygia tusalia*—The Bar-tailed Cuckoo-Dove.—Quite common. Robinson took one clutch of eggs if not more and he and I found a nest in the making, which was however deserted later on. This bird builds the usual platform of twigs, and places its nest on overhanging bamboos.

1314. *Macropygia ruficeps*—The Little Malay Cuckoo-Dove.—Robinson took a clutch of this bird's eggs, about the middle of April as far as I can remember, and I found a nest containing one hard set egg on April 25th. The nest was very difficult to get at being placed high up on a single slender bamboo. In trying to secure the egg it got broken. The nest was composed of a very scanty collection of twigs.

1328. *Gallus ferrugineus*—The Red Jungle-fowl.—Very common, feeding on the roads in the early morning and evening. Jungle Fowl and Pheasants should afford quite good shooting in Thandoung during the open season. When I was there it was the close season and except for shooting two pheasant for identification purposes I desisted from shooting Game Fowl although I had many opportunities. I heard Hill-Partridges once, but did not manage to secure a specimen, so cannot tell to what species they belonged to, probably Blyth's Hill-Partridge, *Arboricola rufigularis*.

1374. *Francolinus chinensis*—The Eastern or Chinese Francolin.—Heard on several occasions in the grassy portions of the country.

The neighbourhood of Thandoung presented no opportunities for the collection of Water Birds and I wish I had been able to make an expedition along the larger streams when I expect some interesting varieties of birds might be obtained.

J. P. COOK.

THAYETUNG, 25th September 1911.

NO. XXIV.—MIGRATION OF BAYA (*PLOCEUS BAYA*).

As the forests of my Division are remarkably dry, Forest-fires are of more serious consequences than any other injury by natural causes. Of the many reasons, that lead to these fires, the Weaver-bird's nest (*Ploceus baya*) is one that keeps the staff employed in fire protection work, anxious all through the fire-season. Either from burning fire-lines or from fires that occur in adjacent unprotected areas, these nests after catching fire are wafted like balloons in the air, and thrown into the protected portion

causing serious damage and disappointment. In nearly five cases out of a hundred, the Baya was found to be the criminal. And to minimize the cases of annual fires, I had arranged to pick up as far as possible all Baya's nests in dangerous places, before the commencement of the fire-season. Accordingly all the staff concerned was carefully watching to find out as to where and when the nests would be prepared. But since the monsoons failed or were unusually late in these parts, grass was not ever available for the Weaver-bird to weave its nest at the proper time. It seems to have made unsuccessful attempts in several localities, where green grass of some kind or other was available, and relics in the shape of a bunch or two of grass are found attached to the ends of the branches of trees. During last month, as I went out in tour of inspection, a couple of my Forest-guards, relying upon these relics informed me that the Baya had begun weaving the nest just then, and in about two weeks' time the architecture would be complete. But as contrary evidence, the cultivators of Jawar assured me that they did not see a single Weaver-bird, and rightly remarked that, as it did not get suitable green grass in time to prepare its nests, it must have migrated to that part of the country, which could supply it with the necessary building material. After inspection of some places, where hundreds of these fresh nests used to be found every year, I came to the conclusion that the Weaver-bird really migrated to some distant part of the country. I think observers in other parts of India and Burma, where there was no change in the monsoons, or where in the absence of timely rains, some other kind of weaving material is available, may be able to corroborate my conclusions, perhaps noticing an unusually increased number of nests this year.

A. B. PUNDE,
Divisional Forest Officer.

GAROTH (INDORE STATE), 26th December 1911.

NO. XXV.—THE MAROON ORIOLE (*ORIOLUS TRAILLII*).

I write to ask if any member will be so kind as to enlighten me on a question of plumage of *O. trillii*, the Maroon Oriole, which in this part of the district is, to my mind, the commonest form of Oriole found. Of the numbers that have lately passed through my hands all those in the full maroon plumage have been males, all in the duller streaked and dark brown plumage females, not young. I write only concerning adults.

The Nepalis to whom the bird is well known, distinguish two sexes by this plumage and my collector at present, an old Pahariah, pointed this out to me and had always asked me to sex birds of this species carefully myself and I must say that so far his assertion has been perfectly correct; at the same time I do not for a moment wish to dispute that the plumage

of the young of both sexes will resemble the plumage of the female. The note of this bird, I may add, much resembles that of *O. melanocephalus* as does it also in habits except that it keeps more to the heavier jungle.

The Nepali name for the bird is 'Singanee,' literally translated "one who blows her nose."

ALEX. M. PRIMROSE.

LONGVIEW T. E., PUNKABARI, P. O.,
D. H. Ry., 16th November 1911.

NO. XXVI.—WOOD SNIPE (*GALLINAGO NEMORICOLA*)
OCCURRING NEAR BANGALORE.

I am sending you a snipe I shot not far from this on the 14th instant. On comparing it with the plates issued with Vol. XX, No. 2, I cannot help thinking it is The Wood Snipe (*G. nemoricola*), as it is too dark in colouring for the Eastern Solitary Snipe (*G. solitaria*).

The record of shooting the bird under reference is as follows:—

I was out snipe-shooting on the 14th instant with Captain W. B. Roberts of the 101st Grenadiers. The country was hilly and covered with scrub jungle, one would not have been surprised to have put up a panther. A lot of paddy fields were scattered about. Besides these there were patches of moist ground, where water had found its way through the bunds of various tanks. We had shot a certain number of Pintail snipe (*G. stenura*) and had just moved on to a patch of water densely covered with matted grass. The grass had been trodden down by cattle, else it would have stood to some height. The snipe, under reference, got up right under Capt. Roberts' feet, in fact he almost trod on it. He was unable to shoot, as it flew along the line of beaters and broke back. On first viewing it, I thought it was a "Painter," but I very soon recognized by its size, dark colour and flight that it was not. Its flight was heavy and slow. Neither Capt. Roberts nor myself heard it utter a sound. I shot it at a distance of about 25 to 30 yards. It is a male. Almost at the same moment as I shot, a florican got up within 20 to 30 yards of where the snipe had lain. It was also brought to bag.

Will you kindly let me know whether I have identified the bird correctly. The skin has not been very well cured. I would suggest its being seen to, as it is a *rara avis*.

If you will send me a form about snipe shooting, I will fill it up and send you my record at the end of the season.

R. M. BETHAM, LIEUT.-COL.,
BANGALORE, 16th December 1911. The 101st Grenadiers.

[The specimen sent is undoubtedly a Wood Snipe (*G. nemoricola*). On page 1155 of Vol. XX of this Journal, the occurrence of the Great Snipe (*G. major*) near Bangalore was also recorded.—EDS.]

No. XXVII.—GOOSE-SHOOTING IN CUTCH.

NOTES BY MAHARAJ KUMAR SHRI VIJAYARAJJI.

In Cutch, goose-shooting is to be had at only one place. This place is on the Runn of Cutch between the Bunni Peninsula and the mainland, N.-W. of Bhuj. Some two or three monsoon streams empty themselves into the Runn near by and in a good year the water collects in a slight depression some two or three miles long by half a mile wide.

Geese have rarely been seen on tanks on the mainland, and then never more than from five to ten in a flock. Bar-headed geese are known in this country, but they are rare. The grey-lag come by thousands to the place mentioned above. They are very difficult to get at, and until fairly recent years no easy way of shooting them was discovered. They, or rather most of them, very early in the morning, long before-day break, leave the marsh which the natives call the Dhandh, to feed on gravel near the mainland some two or three miles off. From the Dhandh they go out in several directions and the shikaris have only got to find out in what places they settle down to pick up the gravel and to sun themselves. Then in the dark before dawn the sportsmen have to take their places just short of the place where the geese settle.

These birds are so curiously particular as to their course of flight that for the convenience of the sportsmen pits are dug in the flat plain of the Runn for them to sit in. A hurdle is slightly raised on the side of the pit facing the Dhandh. Three or four guns can conveniently take their places at distances of, say, from one to three hundred yards between each gun, in a long line before the geese begin their daily flight. The hurdles are made of the same kind of vegetation as grows all round the spot, *viz.*, the laana (*Suaeda* sp.) so they do not seem to catch the eyes of the birds till the sportsman behind them stirs to take his aim.

The geese begin their flight very punctually and regularly. Before you can see clearly in the faint glimmer of dawn, they send out some scouts to see whether the ground is quite clear of an enemy or not. These scouts fly fairly quietly, and as they come when it is still pretty dark, they at times pass out of range without being noticed. As the light begins to grow stronger in the East, the sportsmen's eyes get fixed towards the long dim black line of the horizon which lies stretched out flat and monotonous for miles across one's front. Far away in the distance, you see a flight of birds low down over the horizon in a meagre line advancing steadily towards you; and as they draw close, you can see their wings flapping pretty fast, and can hear them, making the familiar noise—krouk-krouk—so dear to a sportsman who has once before had this experience.

Now begins the proper shooting. The East is glowing, the sky is turning from darkness to blue, the great flat black expanse in front is revealing

itself as flat brown soil thickly sprinkled with the heather-like laana. The noise of the birds awaking far off on the Dhandh is borne more and more loudly to our ears, and meanwhile the geese are coming up in small groups at first with long pauses between. They come in line or in inverted Vs,—krouck-krouck.—Soon it is a case of larger flights; battalion after battalion advances upon the line occupied by the sportsmen; and the guns are getting busy. Now here, now there, a big mass leaves the line and comes thumping down to the earth or else a wounded one is seen gradually to sink below the line of his fellows, and come to ground slowly several hundred yards away. They are either very plucky or very foolish birds. One is rather inclined to think the latter, because true to the course of their flight, they keep on coming by hundreds, heedless of the firing in front of them. If any of the sportsmen find that their direction is changing, early in or in the middle of the shoot, he can easily move his hurdle, place it across the new line of flight, kneel down behind it and recommence.

The proper shooting lasts for about an hour, but it is quite worth the while of the sportsman to wait behind his hurdle for three hours, because there have been many instances of the geese coming from the Dhandh after the shikaris have been called to pick up the dead birds. A gun which happens to be in a good place may fire 70 cartridges any morning; and at the beginning of the shooting, you get some easy shots because the geese fly fairly low and slowly as they approach their feeding ground. Later on when a good deal of firing is going on, they come fairly high and fast, but by no means out of (vertical) range.

There are generally three or four different places which the geese visit in the morning and one can do the shooting at each place in turn on consecutive days. But they do not seem to mind even if you shoot in the one place for three days running. Whether different birds go out to sun themselves each morning or whether the same ones go to the same places it is difficult to say; but the sportsman gets more or less the same amount of shooting for three days in the one place. If four decent shots shoot for three days they can easily get 300 geese. BB shot is advisable; as is also an aim well in advance for their flight is much speedier than it looks; and they can carry much shot, if not hit in the head or neck. It is interesting to take a canoe and paddle out on to the Dhandh later in the day. Crowds of big kurunj will go wheeling off into the sky: huge flocks of big flamingoes will stand at attention as you come into view round some mass of long reeds, and then go running, scuttering and flapping away, long lines of pink against the blue sky with a roar like a fast train rattling over a railway bridge. Ducks paddle about in the long reaches, but are whirring off before you can get near: and the droves of geese are more easily heard than seen. It is a strange republic.

VIJAYARAJJI.

No. XXVIII.—FALCONS AND THEIR PREY.

In a recent number of the journal I noted an attack by a falcon on the gulls in Aden harbour; last week I witnessed another determined and successful attack by the falcon, the victim on this occasion being one of the smaller terns; the falcon struck her prey down to the water and must have killed it at once as I never saw it move afterwards. The gulls and terns united in mobbing the falcon but she picked her quarry from the water at about the third attempt and forced her way out through the crowd finally soaring high above them to the land. It was interesting to see the way in which the falcon disposed of the dead tern so as to make it easier to carry. When she first picked it from the water it hung by one wing from her talons but I could see from my boat that she was as it were rolling the bird up and finally she made a small neat package between her feet. There is only one pair of these birds in Aden and I am collecting evidence which I think points to the fact that they breed here, somewhere in the cliffs on the south side of the Shum Shum range near the Artillery lines.

The ospreys on Round Island have built another nest making three in all on the top of the island. I hope to be able to report the eggs in my next note.

S. E. PRALL, LT.-COL., I.M.S.

ADEN, 7th January 1912.

No. XXIX.—ON THE OCCURRENCE OF THE COMMON WOOD SHRIKE (*TEPHRODORNIS PONDICERIANUS*) AND THE CENTRAL ASIAN BLACK BIRD (*MERULA MAXIMA*), NEAR PESHAWAR.

It may be of interest to record the occurrence of the following locally rare species in Peshawar, viz:—

- (a) The Common Wood Shrike (*Tephrodornis pondicerianus*).
- (b) The Central Asian Black bird (*Merula maxima*).

(a) I met with, when out shooting on the 4th November in a wooded nullah at the foot of the Cherat Hills due south of Peshawar. There were at least two or three of these birds moving about from tree to tree. They were very tame, one individual allowing me to approach within 15 or 20 feet. This bird uttered a pretty note of three or four syllables which unfortunately I did not record at the time. The supercilium was buffish white. This was the only occasion on which I observed this Shrike, although I visited the locality several times subsequently.

(b) Was shot on the artillery jheel within two miles of Peshawar. It flew up out of a deep drain and settled in a tree uttering a note of anger or alarm not unlike that of the Missel thrush, at the same time vigorously

flirting its tail. It was a fine big male over 11 inches in length with a wing measurement of 5.9 inches, and was probably a bird of the year as some of the feathers of the upper tail coverts were bordered with brownish buff. The irides were very dark brown, the bill was horny brown, only the base of the lower mandible and the gape showing yellow.

It is not improbable that this black bird regularly visits Peshawar in winter, as a friend here, who is a good observer of birds, assures me that last cold weather he saw what he described as an "English black bird" in the middle of cantonments.

Within Indian limits this is, as far as I know, the first record of the occurrence of *M. maxima* in the plains. Hitherto it has only been observed at considerable altitudes in the Himalayas.

H. A. F. MAGRATH,

51st Sikhs, F. F.

PESHAWAR, 26th December 1911.

No. XXX.—HABITS, FOOD AND NESTING OF THE
GREAT HIMALAYAN BARBET (*MEGALÆMA*
MARSHALLORUM).

This gaudily coloured Barbet, the largest of its tribe, is a tolerably common denizen of the forests in and around Simla, and is a permanent resident. It is usually to be seen singly, but sometimes in small parties, and during the winter months in large flocks of thirty to forty at a time.

It generally affects high trees, but is frequently to be seen feeding on low ones, and also on small bushes. I have never yet observed it on the ground.

It has a strong and rapid woodpecker-like flight in immense undulations. Having taken up its position on a prominent tree at the top of a hill, it drops, if alarmed or startled, with the velocity of an arrow into the ravine below. It is not particularly shy, and will allow one occasionally to approach quite close to it. I have frequently shot two birds, one after another, from the same tree. The great difficulty, however, is to catch a glimpse of it. For in spite of its gaudy feathers, its plumage blends wonderfully with the foliage of the trees, and it invariably selects the topmost branches on which it sits motionless. When feeding, it is constantly on the move, and all that can be seen are the shaking leaves. I have often waited for several minutes, with strained eyes, trying to catch sight of the bird, and for fear of losing it, have blazed off into the rustling foliage, sometimes with very satisfactory results.

The peculiarity about this Barbet is, without doubt, its extraordinary call. This has been aptly likened to the syllables, "pi-o," "pi-o," "pi-o," and while giving a good idea of it, conveys only a faint impression of the

volume of sound emitted by the bird. Throughout the spring and summer months the hill-sides resound with its monotonous and wailing cries. I shall never forget the day when I first heard its notes. It was many years ago when I first came to Simla. My stay here was uncertain, and I was determined to see as much of this station as possible. On a hot and dusty morning in May, after an early breakfast, I started to explore the "Glen," one of the famous picnicing resorts of the residents here. After wandering about the hill-sides for several hours, I turned my steps homewards, but unfortunately lost my way, as the slopes were densely wooded. After making several unsuccessful attempts to find the path, I threw myself on the hill-side in sheer exhaustion, and determined, after a short rest, to make another attempt to find it. At my feet grew a small bush in full flower, and various kinds of bees were busy at work amidst them. On the opposite side, a pair of parrots had taken up their abode in a rhododendron tree, and were deeply immersed in domestic cares; while close by some Flycatchers were plying their daily vocations. The peaceful scene, combined with the cool and refreshing breeze, and the "drowsy hum of the bees" soon lulled me into dreamland. I could not have been asleep for more than a few minutes, when I was suddenly awakened by hearing a most extraordinary voice above me. It was the love call of this Barbet. I jumped up dazed and startled. The notes above me seem to increase in intensity. Two rivals in the neighbourhood began answering back, and the hill-sides were resounding and echoing with their cries. The act of my jumping up suddenly must have frightened the parrots, for uttering their alarm notes, they darted screeching across the trees. Others in the vicinity followed. A noisy flock of Jays commenced their garrulous chattering, and in the distant ravine I could hear the shrill whistles of *Myiophonus temmincki*. For a few seconds the din and noise around me was so deafening and intense, that I confess I was not only startled, but utterly bewildered, and it was some time before I could quite recollect my senses. I had never heard the like of such sounds before, and can now only realise what must be the feelings of some unfortunate traveller when stranded alone in the depths of a Brazilian forest.

In an interesting article contributed to the columns of the "Madras Mail" of the 5th August 1911 on this bird, Mr. D. Dewar, I.C.S., rightly doubts Jerdon's statement (quoted in the "*Fauna*," Birds, Vol. III, p. 85) that this species lives *entirely* on fruit, as he thinks that such food must be scarce in the hills during the winter months. Long ago the two Marshall brothers in their excellent Monograph on the *Capitonidae* pointed out that the diet of this Barbet consisted both of fruit *and* insects, and Hodgson, whom they quote, remarked that it devoured ants and other insects, but chiefly lived on fruit. As bearing on this subject, the following particulars which are extracted from the paper referred to above, and which relate to

the contents of the stomachs of birds killed in Nepal at various times of the year are interesting :—

February 6th..	..	..	Pulpy berries only.
April 10th, 20th, and 26th	..	..	Leaves of some odorous flower and pulpy fruits.
May 15th, 28th and 31st	..	..	Shining green coleoptera, other beetles and fruits.
October 1st	..	..	Beetles only.

I can fill in some of the gaps above from my diary :—

March 25th and 26th	..	..	Berries and petals of the rhododendron flower.
July 27th	..	..	Figs.

November, December, and January. Large flocks of these birds are to be seen during the winter months in Simla feeding on “Medlars” which apparently constitute their chief diet at this time of the year, and which they swallow whole.

From the foregoing it is, I think, clear that these Barbets are not purely vegetarians, as was thought by Jerdon, and that when pushed for food, beetles and other insects do not come amiss to them. So long, however, as berries, etc., are to be got, it is probable that these are preferred to an insectivorous diet.

As regards the nidification of this species, it has generally been thought that the birds excavate the nesting holes themselves, but in the neighbourhood of Simla, it is by no means unusual to find these Barbets in possession of old holes made by Woodpeckers. I have notes of two such cases: in one I found young, and in the other fresh eggs. The latter, before being blown, had a pinkish appearance owing to the yolk showing through the shell.

The period of incubation in this species has not yet been ascertained, but it probably does not exceed 14 days. It would be interesting to know whether both sexes share in the labours of incubation, and in the feeding of the young. So far as my observations go, I have up to this, seen only one bird, apparently the female, either in or near its nest, but never two; what happens to the other one? Does it hang about in the vicinity, and keep uttering its extraordinary call? Owing to the wary habits of this bird when nesting for it leaves its hole at “long shot,” it is most difficult to make observations.

I have found that occasionally the nesting holes are very deep. On the 29th June of this year I examined one that contained young, and though we dug it to the extent of more than two feet, we did not reach

the bottom. The usual depth of the hole, however, seldom exceeds 12"-18". Hume says that they are only a few inches in depth.

"CARLTON GROVE,"

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, 18th November 1911.

No. XXXI.—MARBLED DUCK AT BARODA.

A bag of 78 duck made near Baroda on the 19th November included three specimens of the Marbled Duck (*Marmaronetta angustirostris*) which I had not previously met with. I shot two of these and a gadwall out of a small pack of four duck flying past. The remainder of the bag consisted mostly of pochards and gadwalls. These duck were much more grey in colour than those figured by Mr. Stuart Baker.

R. G. BURTON, LT.-COLONEL,

BARODA CAMP, 20th November 1911.

94th Russell's Infantry.

No. XXXII.—THE SOOTY TERN (*STERNA FULIGINOSA*) IN CACHAR.

The Sooty Tern is one of these essentially sea-birds which generally haunts ocean islands and is but rarely found even on the coast of an Indian continent; its appearance, therefore, so far inland as Cachar, 170 miles in a bee line from the nearest sea, is most remarkable. This specimen in question was shot by one of my collectors, Mahomed Ismail Mia, on the Silcoorie bhil on the 3rd of June this year, 1911, whilst he was engaged in shooting for me a pair of baya-birds. He was watching the baya-birds at their nests and waiting until he could select a specimen in perfect plumage, such as I required, and noticed this tern fly past. It struck him as something new to him and on its again flying past he shot it and sent it home to me. Ismail is a thoroughly reliable man who has worked for me for over twenty years and worked for Hume before then, moreover, he has not been out of Cachar and Sylhet this year so could hardly have got it anywhere else. The specimen obtained was quite a young bird in complete "sooty" plumage except for a few white feathers from the breast which shewed up over the shoulders of the wing. It was probably driven inland during the heavy gales of May and then instead of returning to the sea-coast worked its way up some of the big rivers into the Surma Valley.

E. C. STUART BAKER, F.Z.S., F.L.S.

BROADSTAIRS, 1st November 1911.

No. XXXIII.—NOTES ON THE SOUTHERN MIGRATION OF SNIPE NEAR CALCUTTA, 1911.¹

This year the first Snipe were shot near Calcutta during the last week of August; they had in all probability come in with the moon which was

full on the 8th September. On the third of September one gun obtained over 20 couple. On 10th I was out with a friend and we only got 16 couple between us. This was at a place about seven miles north of the famous Kanchrapara Jheel; the day was wet and cold, and also there was a strong wind blowing all the time. These two bags were entirely composed of Pintail.

I did not shoot again that month, but heard of some quite nice bags from those jheels. As far as I could discover they all were Pintail. I visited the same jheel on the 15th October, just a week after the full moon. I was alone and got 10 couple of Pintail and 2 couple of Fantail, also 2 brace of Golden Plover. There were 4 other parties on the same jheel that day and their bags were as follows:—

2 Guns	..	..	.. 10 couple.
4 Guns	..	..	.. 24 couple.
3 Guns	..	..	.. 24 couple.
2 Guns	..	..	.. 12 couple.

I examined these bags and found practically no Fantail among them. I shot nearly all my birds at midday in the shade of trees and bushes at the edge of the paddy fields.

I have not been out myself this month, but I have heard that all the old spots are now empty, and that nearly all the birds shot are Fantail. These presumably came in with the moon which was full on the 8th of November.

I have not heard of any large bags this year; in fact, most of them seemed to be remarkably small for this part of the country.

There are, however, thousands of birds exposed daily for sale in the Calcutta Market all of which are sent in from places in the neighbourhood. Unfortunately I shall not be here when the Snipe migrate north again. Personally I can see no difference between the flight or cry of these two varieties of Snipe.

C. R. S. PITMAN,
27th Punjabis.

ALIPORE, CALCUTTA, 14th November 1911.

NO. XXXIV.—OCCURRENCE OF THE NUKHTA OR COMB-DUCK (*SARCIDIORNIS MELANONOTA*) IN SIND.

It may be of interest to record the occurrence of the Nukhta (*Sarcidiornis melanonota*) in Sind. A couple were shot at Khahi Dhand, Sujawal, Karachi District, on December 27th, 1911, a male by Mr. S. R. Arthur, I.C.S., and a female by myself. A flight of six was also observed on the same day by several members of the party. The local fishermen appeared to be acquainted with the bird, which they called "hanj," the ordinary

word for a goose, distinguishing it from the Grey Lag, which they called "Lalu Hanj"; the distinction suggests that the Nukhta is the commoner of the two at this dhand. Two years ago at the same dhand I saw a number of birds which I now believe to have been Nukhta, though at the time I could not identify them as I failed to shoot a specimen.

HYDERABAD, SIND,
January 5th, 1912.

M. WEBB, I.C.S.

[The Society has just received the skin of a female Nukhta from Mr. R. L. McCulloch, who shot the bird near Sujawal, Sind, on the 12th February 1912. Mr McCulloch writes that the Sindhi name for this duck appears to be "Káro hānjh" (= Black goose).—EDS.]

No. XXXV.—THE BREEDING OF THE FALSE HIMALAYAN
VIPER (*PSAMMODYNASTES PULVERULENTUS*).

In my article on this Snake in the Popular Series appearing in this Journal (Vol. XX, p 73), I could mention but little of the breeding. Two gravid females lately received from Shillong, both killed in August, throw further light on the subject. One measured 1 foot 10 inches and contained three foetus (1 ♂, 1 ♀, and 1 ?), the largest of which measured $6\frac{1}{16}$ inches. I captured a hatchling in Rangoon only $4\frac{3}{4}$ inches long, so that the length of the young at birth is very variable. The second specimen measured 1 foot $6\frac{7}{8}$ inches, and contained 4 embryos (2 ♂, 2 ♀). These were nearly the same length as in the last. I noticed that the ♂ claspers are bifid. In both cases the development of the young left no doubt that they would very shortly have been born. The fact that my hatchling in Rangoon was captured in June shows that the breeding season in the Hills is later than in the Plains, as I find the case in so many snakes.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31st August 1911.

No. XXXVI.—FOOD OF THE SNAKE *RHABDOPS BICOLOR*.

Among other Snakes recently received from Shillong I have had six specimens of *Rhabdops bicolor*. I find that their food consists of earth-worms. The stomach contained a great deal of mud mixed with which were fragments of various lengths of worms of substantial calibre. The intestine too was loaded with mud, probably derived from their Oligochaete diet.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31st July 1911.

No. XXXVII.—THE DIET OF A BULL-FROG (*RANA TIGRINA*).

In Vol. XX., No. 3 of our Journal, Mr. H. M. Chibber has a short note on the diet of a bull-frog, *Rana tigrina*. I wish to supplement the information he has given by some facts from my observation. In the course of a dissection of one of these animals, my students observed, in the earlier part of September, the remains of a land-crab in the stomach. The abdomen of the crab had already been digested, but the great chælae and carapace were found inside the stomach. My mother also tells me that she has frequently observed frogs eating land-crabs in the paddy fields during the rains.

My friend Dr. V. G. Chiplunkar of Baroda informs me that he has once observed one of these frogs swallow a green snake of about medium size. The frog first caught its head in its mouth and then gradually swallowed it. He was unable to say anything about the species of the snake as it escaped in water before it could be secured. It seems, therefore, that the dietary of a bull-frog contains a very large variety of animals, and further observations on this point by our members would yield interesting results.

S. P. AGHARKAR.

BOMBAY, 1st October 1911.

No. XXXVIII.—NOTES ON THE INDIAN CHAMÆLEON
(*CHAMÆLEON CALCARATUS*).

I send the following notes on two Chamæleons kept in captivity by me.

The first, which was subsequently seen to be a female, was found near Jubbulpore, C.P., and after some months of close captivity in a wire cage, was bought by me on 16th September 1911. Her colour was, as a rule, green of varying shades. In the bright sun, she rapidly turned a very dark earth colour, at night, a light greenish yellow. If angry, she would come out in thick black spots as large as small peas. Length about 13 inches. She lived then, on my office punkah ropes and ate large numbers of grasshoppers and very small frogs, of which latter she once devoured 8 in succession. Her gymnastic powers were extraordinary. To reach an insect out of range of her tongue, on another rope of the punkah, she would do what in gymnastic terms is called a "plant," viz., extend her body into space, at right angles to the rope which she gripped with her tail and hind legs. This would extend her range considerably, but, if still not close enough to her prey, she would slide down the rope in stealthy jerks, still holding on by her tail and hind legs, until, as the two ropes converged she was near enough to shoot. Range of tongue, at the most, about 9 inches. Given a walk in the garden every day, she would make repeated efforts to escape, and invariably in the same direction, viz., to a "mendi" hedge. Having reached the top of this, along it some 10 feet to where a twig of a

Gul Mohur tree approached to within a foot of the top of the hedge. Then, standing upright on her hind legs, she would catch hold of a thin frond of Gul Mohur and pull herself up on to the twig. Thence upwards to the main part of the tree where her colour, green and black, blended so perfectly with her surroundings as to render her detection and retrieval difficult. Defecated lifting a hind leg and would always clean her anus carefully against a twig or leaf. Excrement very full, like a turkey's. On level exposed ground her walk was slow and stilted, each leg being waved in a curious vacillatory motion before being set to the ground, but once under cover she strode forward freely, though very slowly.

On 5th October 1911 the male arrived, also from Jubbulpore. He seemed dry and emaciated, colour mustard yellow, with black spots, length about $14\frac{1}{2}$ inches. No strength in his tail. However, on being placed on the punkah, he at once climbed to the top, under the ceiling and copulated with the female "a tergo" grasping her with all four legs. She was then a uniform light green. Coition took place three times that day and once the next. As he would not eat, he was put on a bush outside and water poured over him. He drank greedily, licking the drops off the leaves. His tongue then, though very dry and stiff, probably because his former master had never given him a drink, got to work on the grasshoppers. (From this time forward his colour day by day assumed a deeper tinge of green until in a month he was as green as the female.)

I now enclosed a bush some 4 feet high, set in a large pot with muslin netting on a frame and put both chamæleons into it. On 7th October 1911, *i.e.*, 2 days after mating, the female assumed a wonderful colour, *viz.*, jet-black, covered with spots of vivid emerald and ochre yellow, though at night she turned the usual light green. She now showed rage if the male came near her, rocking her body to and fro and gaping at him with faint hissings. He on the other hand would fly in ludicrous terror falling headlong from his perch if she came near, as though paralysed. From thence forward his object has been to put as great a distance as possible between them both. On the 28th October his skin began to peel in large patches. The female showed obvious signs of pregnancy by then, and invariably moored herself securely to her roosting perch by 2 or 3 turns of her tail, resting her belly carefully and evenly along the branch. I now scooped out a handful of earth at the bottom of the bush, and covered it with a tile, so as to make a kind of "cabin." On 9th November 1911 the female descended into the hole and began to dig like a terrier, packing the loose earth with her fore legs and kicking it out behind her with her hind legs. At night she roosted in the bush, but low down. All next day, the 10th, she dug furiously in the loose mould and did not emerge at night. Next day, the 11th, a very attenuated chamæleon emerged at 2 p.m. and spent all afternoon in pulling the loose earth back with her fore paws, ramming it

well behind her with her hind legs. Colour first muddy, then vivid green and black. Roosted all night. Next morning 12th completed the filling up of her burrow.

On the 13th I had her put into the garden and began to search for the eggs. As they are evidently deep down, I had the whole bush gently lifted up by the roots, when a heap of eggs were visible in the loose mould at the bottom of the pot, nearly a foot from the surface. Eggs were whitish, shaped like a snake's, a perfect oval, about a half inch by a quarter inch, and numbered 31. I replaced 20 and the rest were put in another pot. The female still drives the male away if he comes near her. A few general remarks on these animals as pets may be of interest. They are voracious and should be watered, on a bush, at least once in two days. They will not drink out of a receptacle. Their gymnastic feats are a source of endless amusement and interest and they give the impression of possessing an intelligence much above that of other reptiles. They are long sighted and very tenacious of purpose. If put on the floor of the verandah my own would invariably first take their bearings and then make for the hedge, climbing it at the same spot in order to catch the over-hanging branch of the Gul mohur tree. Their dominant purpose is still to escape into the high branches of this tree. If kept in a wire cage their persistent efforts to escape lead to the skin of their nose being frayed to the bone, but a cage of mosquito netting obviate this mishap.

I should be grateful for any information the Society can give me as to their distribution, also the size they attain. An informant tells me of one over two feet long, picked off a tree during a beat in one of our Southern districts and kept tied to a peg for two days when its captors killed it and dried its tongue and heart for a charm. I should have unhesitatingly put this animal down for one of the so-called 'iguanas' but for the description of its gait, shape and colour and the incident of its death, for while the tongue and heart of a chamæleon have noted magical properties in this country, I never heard the same of the iguana.

C. CHENEVIX TRENCH, I.C.S.

DAMOH, C. P., 15th November 1911.

[The iguana referred to is probably the Indian Monitor or 'Ghorpad' (*Varanus bengalensis*). The largest chamæleon which is in our Museum measures snout to vent. 7½ inches, tail 8½ inches, a total length of 16 inches.—EDS.]

No. XXXIX.—SNAKE EATING A SNIPE.

On 20th November while I was out snipe shooting with my wife a curious incident occurred which I think is of sufficient interest to record. I had brought down a couple of Snipe and my wife had gone to pick up one while I went to get the other. On approaching the spot where the

bird had fallen my wife saw a large snake and called out to me "there is a big snake here," almost immediately adding "and it is eating the snipe." She stood quite still to observe and saw the snake open a cavernous pair of jaws and seize the snipe by the tail, but I, foolishly hurrying up, attracted the attention of the culprit who dropped the snipe and made off. I put a charge of shot into the snake as it disappeared, but it managed to escape into a clump of bushes, so I was unable to identify it, but from the glimpse I got of its tail and body I have little doubt that it was a rat-snake (*Zamenis mucosus*). The snipe's tail was somewhat mauled and covered with saliva when picked up.

F. E. W. VENNING, CAPT.

PYAWBROE, 7th December 1911.

No. XL.—SOME NOTES ON THE HATCHING OF THE
AGAMOID LIZARD (*CALOTES JERDONI*).

On a pouring wet day, 11th August 1910, I found by the side of a jungle path near Haka, Chin Hills, (alt. 6,200 ft.) one dozen lizard's eggs, the largest of which measured 75×55 inches. The eggs were scattered irregularly over an area of about three feet by six inches, and were all lying on the surface of some moss under a pine tree. The situation was a steep hillside and there were torrents of water coursing down the path and through the jungle, but the position of the eggs, which was somewhat raised and was also sheltered by the tree, pointed to the conclusion that they were still in the place where they had been originally deposited. On reaching home I opened one of the eggs and extracted a living young one of this species, apparently almost ready to emerge. The position of the hatching in the egg was as follows:—head bowed on chest, nape occupying the pole of the egg, back considerably bent, tail neatly curled inwards on the belly, fore limbs crossed, I think, on the chest, but I could not be certain of this point nor of the position of the hind limbs as the lizard stirred almost immediately on the egg being opened. In 1908 I had twelve eggs of this species which hatched on and after the 20th August, so I placed the remaining eggs on some moist earth in a large chattie and awaited developments.

At 7 a.m. on the 28th August I noticed that one of the eggs had several cuts in the shell and the hatchling's snout was visible through one of the openings. I promptly placed a second egg in strong spirit for future examination and returned to egg No. 1. This I placed with great care under the microscope using a low power objective (1 inch) and could just detect the foetal tooth as a minute triangular white point projecting under the rostral shield. By 8 a.m. nothing further had occurred, but the little lizard was breathing deeply, each breath causing an efflux of moisture from

the slits in the shell. I had to leave the egg now and could not resume my observations till 10-40 a.m. when I found the young lizard's whole head protruding from the shell and its eyes wide open and fully conscious of my movements. After about five minutes the hatchling made an effort to obtain its release and at the second attempt wriggled out of its shell and without pausing ran to the edge of the chattie and fell over. I rescued it and placed it in a finger bowl. It was extremely lively. The navel aperture was distended and a globular piece of whitish (apparently albuminous) matter was extended measuring about one line in diameter. This subsequently became rubbed off on some earth. At 11 a.m. the measurements were; head and body 1.2 inches, tail 2.8 inches. The dorsal crest and two rows behind the eyes showed as distinct ridges, and in all other respects the specimen was perfectly developed. A little albuminous matter remained in the shell, which was extremely tough and of the consistency of white kid glove. Egg No. 2 showed no signs of cuts when I put it in spirit, but at about 11 a.m. I found the hatchling had broken the shell and struggled half out before succumbing.

The remaining eggs all hatched similarly except that the occupants were not so much disturbed and had the navel aperture quite free from any matter when they emerged and showing merely as a longitudinal slit about $\frac{1}{8}$ inch long.

The hatchlings had in a very marked degree the power, conscious or unconscious, of assimilating their colour to the hue of their surrounding, becoming brownish when placed on bare earth or a brown twig and greenish when placed on a green leaf.

A full-grown female of this species taken by me on 10th May 1910 was found to contain 12 eggs, the largest of which measured $\cdot 6 \times \cdot 25$ inches, but in this case the eggs were very soft skinned and contained no traces of any development of the embryo.

Major Wall has described the finding of a pair "in copula" on 25th August in the Khasi Hills (B. N. H. S. J., XVIII, page 506). It would appear, therefore, from the scanty records above that the period of gestation lasts a whole year, but further observations would be interesting.

The activity of the hatchling immediately on emergence from the egg and its ability to adapt its hue to that of its environment are evidently inherited protective devices of considerable importance to the species when one remembers the large number of Ophidia, not to mention birds, that prey upon it. In this connection I might mention that a very young mongoose I had, which was also very weak on its legs, one day pursued and captured an adult *C. jerdoni* to my utter astonishment. The lizard was obviously very much fleet of foot, but the mongoose followed slowly but relentlessly until the lizard was apparently run to a standstill, when it was captured and devoured.

It is to my mind a most wonderful endowment of nature which enables the young Calotes to make full use of its limbs the moment it sets foot to earth after being curled up in its egg during the whole of its prenatal existence, and a very powerful objection to the argument that the young have to learn everything from example. "*Experientia docet*"—it is trying that teaches, but here we have the first trial a fully perfected art achieved without precept or example.

The method of opening the egg for the exit of the lizard is also of some interest by reason of the economy of energy shown. I append a rough illustration of the cuts in three of the eggs prior to the appearance of the young one. The table shows the time taken in the actual process of hatching as far as it could be observed.

No. I.



No. VI.



No. V.



× 2.

Another question which suggested itself to my mind was whether the exudation of moisture, noticed in almost every case after the first cuts had been made and caused by the inhalations of the lizard, were merely accidental overflowings of albumen or an intentional device of nature for softening the hardness of the leathery integument and so facilitating the exit of the hatchling?

No.	First cuts observed.	Hatchling out of shell.
1.	7 a.m. (28th)	10-45 a.m. (28th).
2.	Placed in spirit.	
3.	7 a.m. (28th).	Not noticed: shell empty 3 p.m.
4.	6-30 p.m. (28th).	8-20 a.m. (29th).
5.	8 a.m. (29th).	11 a.m. (29th).
6.	11 a.m. (30th).	4 p.m. (30th).
7.	11 a.m. (30th).	4 p.m. (30th).

Remainder escaped observation.

F. E. W. VENNING, CAPT.

PYAWBROE, 7th December 1911.

No. XLI.—BREEDING OF MACCLELLAND'S CORAL SNAKE
(*CALLOPHIS MACCLELLANDI*).

Among 128 snakes sent me from Shillong this year, I have had four specimens of Macclelland's coral snake. I can find no observations of the breeding habits of this species, so that the receipt of a gravid ♀ is worthy of remark. This specimen, which was killed in August, measures 1 foot 11 inches. It contained 6 eggs, 2 in one ovary and 4 in the other. The largest of these eggs measures $1\frac{5}{16}'' \times \frac{7}{16}''$. On cutting this open I discovered a small embryo lying in a chamber just beneath the ovicular membrane. The embryo would, I judge, measure one to one-and-a-half inches unravelled. The head is formed, the eye, mandible, and a beaked snout evident, and the heart also visible outside the abdomen. The condition is exactly similar to that seen in the eggs taken from the abdomen of the *Lachesis monticola* included in the same collection. It seems to me probable that these eggs were on the eve of being discharged, but on this point I cannot of course speak with certainty.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

ALMORA, 31st August 1911.

No. XLII.—THE MADRAS AQUARIUM.

A most interesting little guide* to the Madras Aquarium has just been published by Dr. J. R. Henderson, the Honorary Director. This guide contains not only a general account of the Aquarium and of the fish usually to be seen in it but also a number of interesting observations on the habits of fish and marine reptiles that are liable to escape notice unless attention is called to them. I have therefore gathered together some of them in the following notes, which I hope that Dr. Henderson will see his way to elaborate:—

1. "Finally it may be remarked that among some of the inmates of the Aquarium the colours fade after a time. This is particularly noticeable with regard to the beautiful red bands of *Lutianus sebæ*" (p. 7).

I have noticed myself that certain silvery freshwater fish (e.g., *Notopterus kapiarat*) turn black after a few weeks' exposure in an aquarium; Dr. Henderson's remarks apply, of course, to marine species.

2. "The sea-snakes are usually represented by *Enhydrina valakudien*, which is very common on the Madras Coast, but various species of *Hydrophis* and *Distira* will be found from time to time. In spite of their extremely poisonous nature, they rarely inflict injury on the fish living in the same tank, yet more than once sea-snakes have fallen victims to and been eaten by the latter. The snakes are fed on small dead fish" (p. 8).

* *Guide to the Marine Aquarium, Madras*. Printed by the Superintendent, Government Press. Price 1 anna.

3. "The Green or Edible Turtle (*Chelone mydas*). Common on the Madras Coast. This species is usually described as herbivorous, but local specimens are quite as carnivorous as any of the other turtles" (p. 13).

4. "[This tank] contains at present a shoal of a single species of Sea-Perch (*Lutianus jahngarah*) which . . . are noticeable for the high degree of intelligence which they exhibit at feeding times. The appearance of an attendant bearing a pail, even half-way across the Aquarium, is sufficient to throw them into a state of wild excitement" (p. 16).

The difference in intelligence (? or eyesight) between these fish and other species in the Aquarium is most marked, as I can testify from personal observation in the circumstances described by Dr. Henderson.

5. "The species of *Serranus* exhibited in the Aquarium regularly go to sleep every night at the bottom of the tank, where they remain motionless till morning. Several fish in the Aquarium have the same habit, while others at night simply remain motionless in the water and do not rest on the bottom. On the other hand many fish do not appear to sleep, as they keep constantly moving all night" (p. 17).

I understand that the *Serrani* when asleep lie on one side on the bottom.

N. ANNANDALE.

CALCUTTA, January 1912.

NO. XLIII.—THE LIFE OF A DOG TICK.

The small brown tick on a dog sucks up the blood until it swells up and then it falls off. It will be noticed that there is always a small tick attached to every swollen one—this is the male. After the swollen tick has fallen off, it climbs up the wall into the ceiling or hides in any convenient crack and deposits its eggs (some thousands), 40 per cent. of these in turn hatch out and become minute ticks which get on to the dog and suck its blood till they in turn swell up to the size of about six pins' heads, they then drop off and seek some crack in the wall or some picture on it and in time change into the ordinary brown tick. Anyone who keeps a dog in his room might notice ticks on the wall.

W. J. MASSY, CAPT.,
12th Pioneers.

KIRKEE, 26th August 1911.

[Mr. F. M. Howlett, 2nd Imperial Entomologist, Pusa, has kindly supplied the following note on the above :—

"Ticks are generally divided into two main families, Argasids and Ixodids. The commonest argasid in this country is the flat fowl-tick (*Argas persicus*), while the dog-tick (*Rhipicephalus sanguineus*) is an ixodid. Ixodids have a characteristic horny shield on the back, which nearly covers the

back in the males but is comparatively small in the females ; this shield is absent in argasids, whose skin is uniformly leathery and often covered with little warts and pits. The female ixodids gorge themselves with blood to a much greater extent than argasid females are accustomed to do, and there are various differences in habits, length of life (much greater in argasids), number of eggs laid (much greater in ixodids), number of moults, relation to the host, sexual relations, and so on, as well as in structural characters.

As regards the life-cycle of ticks, there appear to be several types, varying in the degree of connection of the different stages of the tick with its host or hosts (*i.e.*, the animal on which it feeds). The number of stages in argasids is usually four (though sometimes five or even six) ; larva, nymph 1, nymph 2, adult : in ixodids 3, larva, nymph, adult. In both the larva is six-legged, the other stages eight-legged. In the relations of the different species to the host, Nuttall (*Parasitology*, Oct. 1911) has defined five types as being of ordinary occurrence. The relations of argasids are of types 1 and 2, in which the ticks feed in succession on an indefinite number of hosts, making a large number of comparatively small meals of blood and leaving the host when satisfied, the adult females often laying a batch of eggs after each meal. The relations of ixodids are of types 3, 4 and 5 ; in type 3, each stage (larva, nymph, and adult) feeds on a separate host, dropping off and moulting when full-fed (*e.g.* *Rhipicephalus sanguineus*) ; in type 4 the larva and nymph feed on the same host and the adult on a second host (*e.g.*, *Hyalomma aegyptium*, a common Indian cattle-tick), while in type 5 (genus *Boophilus* only) the larva, nymph, and adult stick to the same host throughout.

In most, if not all, species the female tick, after filling up with blood, sooner or later drops off the host and lays her eggs in heaps on the ground in any convenient sheltered place, and the larval ticks after hatching almost always crawl up anything within reach, such as walls or grass-stems, and there, with the utmost patience and tenacity of purpose, they wait for the coming of a suitable victim, to whom they at once attach themselves. Their subsequent behaviour is in accordance with one of the types indicated above, and this should be borne in mind in applying measures for getting rid of them : it is of little use to concentrate on keeping a dog's coat clean when all the time the floor or the walls of the place he inhabits may be harbouring numbers of eggs, or of larvæ, nymphs, or adults, which have dropped off him merely to moult and then return to the charge."—Eds.].

No. XLIV.—ASILID OVIPOSITION.

Time—8 a.m., April 27th, 1911.

Weather—Dry and hot.

Place—The Gooseberry plot of the vegetable garden at Pusa, the exact spot selected being a dry, wrinkled, worn-out gooseberry leaf that would

have dropped down in the course of three days. The oviposition was made in the fixed end of the leaf which had shrivelled up into a few pouches, the ootheca being deposited into one of such pouches.

The soil in and about the gooseberry plot was moderately hard, very dry and somewhat sandy. Digging showed absolutely no trace of any subterranean insects that the newly hatched-out larvæ might be expected to feed upon nor any crannies or fissures through which they could easily make their way deep into the earth. The place was not at all shady nor well-protected from wind and rain, though the plant was in the midst of numerous other similar plants. The season was just after the harvesting of the fruits.

Movement of the fly just prior to oviposition :—

The Asilid was observed darting from place to place apparently very restlessly. It first perched on a green leaf, but left it at once and went to another which was also discarded; the next one was also rejected and so also the fourth and so on for five times till it came across the suitable leaf.

Manner of oviposition and posture of the fly while ovipositing :—

The leaf was not quite horizontal with the ground but at some inclination and the Asilid sat at once parallel to the leaf, her face pointing down towards the ground and tail upwards to the plant. The first position in which she happened to sit seemed quite convenient for her, and she did not move about on the leaf to accommodate herself more comfortably.

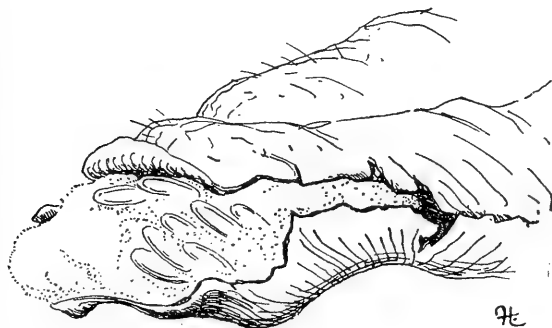
While ovipositing the tail was slightly curved all along pointing to a fixed spot on the leaf; probably the semi-fluid looking substance gradually flowed out to occupy the entire portion of the pouch.

She was in that position for nearly ten minutes. Her wings rested in repose, all the parts of her body remaining stationary save the tail which was noticed moving in and out like the retractile sting of an *aculeate hymenoteron*. With each movement a very small quantity of white stuff could be faintly discerned to be coming out, but the fear of scaring away the fly stood in the way of knowing then the exact nature of the substance or the order in which the different constituents of the stuff were coming out, though subsequent examination cleared both the difficulties. After about ten minutes the fly suddenly flew away

The Ootheca :—

It was very irregularly shaped, pretty firmly lodged in the pouch of the leaf the greater portion being concealed from view. At the first sight it would give one the impression of white excreta of some birds not infrequently seen on leaves and branches and a superficial examination did not reveal the existence of any eggs; all that could be seen was a very finely porous, frothlike white mass having the consistency

of freshly fallen snow, not of uniform level all throughout but undulating here and there. With time the mass gradually set harder, ultimately turning into the consistency of very fine camphor granules firmly stuck together. On breaking open a portion of the frothlike substance beautiful eggs were discovered. The eggs were oval-shaped, very small in size (about $\frac{1}{8}'' \times \frac{1}{16}''$), colourless, having prismatic reflections, very closely in touch with one another, the portions of the eggs in touch being the sides, the extremities being more or less free. There were two tiers of eggs one above the other. A colourless but palpable exudation held the eggs on the tiers together, the whole egg-mass being encrusted in the external "froth." After nearly a fortnight the egg-mass turned yellowish.



The other substance was very easily soluble in absolute alcohol.

The size of the ootheca was above $\frac{3}{4}'' \times \frac{1}{2}''$.

The egg-mass was put in a vessel with as much earth and moisture as were deemed necessary, taking additional care to put in earth of the very place on which the leaf was on the point of falling. But the eggs gradually shrivelled up and did not hatch. A discovery of one or two empty egg-cells suggested the possibility of the presence of newly hatched-out larvæ but a search to find them out was futile.

As the use of the incrustation was obviously, among other things, to protect the egg-mass from undue exposure, it is not impossible that the opening made into the mass was wholly or partially responsible for the eggs not hatching in the presence of conditions which, though of course artificial, were made as favourable as possible.

S. K. SEN,
Asst. to 2nd Imp. Ent.

No. XLV.—CATERPILLAR PEST ON COTTON IN KHANDESH.

I was recently summoned to Jalgaon. Khandesh, to investigate and suggest remedies for what was said to be a very serious caterpillar pest of cotton, and some short notes on my observations may not be without interest.

The pest proved to be the common, semi-looping, noctuid caterpillar (*Cosmophila erosa*). Of this Lefroy (*Indian Insect Life*, page 453) writes as follows. It "is common as a green semi-looping larva on cotton and malvaceous plants: the male moth darker in colouring than the female. The semi-looping larva is a common pest of cotton (*Malachra capitata*), bariar (*Sida rhombifolia*), and some other plants during the rains."

The attack in the present case took place during September, and when I reached Jalgaon on September 26th, the main portion of the attack was over. The caterpillars appeared about the second or third week in September, and disappeared at the end of the month. At the time of my visit I was only able to collect large quantities of the pupæ in the folds of leaves. Nine pupæ out of ten were parasitised with *chalcidid* *Hymenoptera*, with a few *ichneumonids*, and also a few parasitic diptera (*tachinids*). There is thus comparatively little danger of an early repetition of the attack.

While the attack of the caterpillars was severe, the damage done was great. The stalks only of the plants remained standing. Every bit of leaf had been eaten away by the pest. The serious damage done, however, was not very extensive. Reports only being to hand from four or five villages, namely Jalgaon itself, Pimprola, Sirshola and Jamner. All these were within a radius of twenty-two miles of Jalgaon.

The caterpillars have not limited their attention to cotton, but have also attacked ambal (*Hibiscus cannabinus*), which is often sown as a mixture in the cotton fields, and Mug (*Phaseolus mungo*) and Udid (*Phaseolus radiatus*), which are sown in admixture with jowar (millet).

R. S. KASARGODE,

Lecturer on Entomology, Poona Agricultural College.

POONA, October 1911.

No. XLVI.—NOTE ON THE BUTTERFLIES *LETHE KANSA*
AND *DOPHLA PATALA*.

May I issue a small defence to the charge of inaccuracy brought against me by Mr. Hannington in his note on page 286 of the last number (No. 1, Vol. XXI) of the Journal, though the charge, at first sight, appears justified. The fact was that my "Notes on some Butterflies from the Indian Region" had been written long before, and as far as my recollection goes, were already in proof in the Editor's hands when the number of the Journal

with Mr. Hannington's article reached me. I had thus no opportunities to refer to his record. My specimen of *L. kansa* was taken on Ayarpatta, Naini Tal, about 7,000 feet, in June 1903, and though I was frequently on Cheena, I never saw the species there. June and July were probably too late, for Mr. Hannington's record would indicate that the species appears in a spring brood.

As regards its range in Sikkim, where I have collected a good deal, my experience was that the species was fairly common up to about 2,000 feet, but was never seen about 3,000. Mr. Elwes' record quoted extends the range, but I fancy its appearance at high altitudes is rare. I see from the last number of the Journal (Vol. XXI, p. 53) that Major Tytler has taken *L. kansa* only at the foot of the Naga Hills, so my remarks as to the altitudinal range of the species remain generally good.

It would, as Mr. Hannington says, be interesting to know something of the food plants of the larva of *D. patala* or *D. taotana* in Lower Burma. Can any one oblige?

Having collected a good deal in Kumaon myself years ago, I was particularly interested in Mr. Hannington's valuable list, and I had hoped, when it was appearing, to write to him and give him such additional information as I had. I was at the time unfortunately overburdened with official work and have since been away on furlough. I hope to be able to exchange notes with him at some later date when I have my books and collections again about me. At present I can only remember that I wished to communicate to him a note of the capture of two males of *Poritia hewitsoni*, Moore, near Ranibagh, 2,000 feet, in April 1903. Mr. Hannington remarked that he had not met with the species in Kumaon.

G. W. V. DERHÈ-PHILIPPE, F.E.S.

MADRAS, 7th December 1911.

NO. XLVII.—*PAPILIO POLYTES* IN BANGALORE.

With reference to Mr. Fryer's appeal for information concerning *Papilio polytes* which appeared in the last number, it may be of general interest to record that the species is trimorphic in Bangalore. All the three forms were reared in the insectary attached to the Entomological Laboratory here, from eggs found on the Curry leaf tree (*Murraya koenigii*, Spreng.). The association of mimics and models came to my notice only once at Honnali, Shimoga District, where *P. hector* and the *romulus* were observed together on *Poinciana regia*, Bojier.

K. KUNHI KANNAN,

Assistant in Entomology to Dr. Coleman,

State Mycologist and Entomologist.

BANGALORE, 22nd December 1911.

No. XLVIII.—A NOTE ON *TRICHOSANTHES DIOICA*, ROXB.

C. B. Clarke's description of the plant (p. 609, Hk. F. B. I., Vol. II) runs thus :—"T. dioica, Roxb. *Fl. Ind.*, III, 701; leaves cordate, oblong acute, petiole scabrous woolly, male flowers not racemed, woolly without, anthers free, Wall., *Cat.* 6692, A. B. D.

Throughout the plain of North India, from the Panjaub to Assam and Eastern Bengal; common.

Stems twining extensively, more or less woolly and scabrous. *Diæcious*. *Leaves* 3 by 2 in., harsh, sinuate dentate, not lobed; petiole $\frac{3}{4}$ in.; tendrils 2-fid. Male *peduncles* paired, the second-flowering often 2 in., but not racemed in any example at Kew. *Calyx-tube* $1\frac{1}{4}$ in., narrow. *Fruit* $2-3\frac{1}{2}$ in., oblong, or nearly spherical, acute, orange-red. *Seeds* $\frac{3}{8}-\frac{1}{2}$ in., half ellipsoid, compressed, corrugate on the margin."—United with *Trichosanthes nervifolia*, Linn., D. C. *Prodr.* iii, 314 by Bentham in *Fl. Austral.* iii, 315. "Roxburgh says 'Stamens three distinct' which has been repeatedly verified in the living plant."

Be it noted that *T. nervifolia* is figured by Rheedee in *Hortus Malabaricus*.

When in a former series of papers of mine under name "*The Poisonous Plants of Bombay*", I published a description of *T. cucumerina*, Linn, which is abundantly found in the Dekkan and Konkan, Lt.-Col. Peters said to me that there was found in Eastern Bengal a plant under the name of Patol which was edible. Its botanical name is *Trichosanthes dioica*.

In his letter to our Hon. Secretary, dated 10th November 1911, from Dinajpur (E. Bengal) Lt.-Col. C. T. Peters writes the following interesting note on *Trichosanthes dioica*, Roxb. (Hindi, *Pulwul*; Bengali, *Patala*):—"The gourd is used as an esculent vegetable and especially prized, as it is in season when other vegetables, both European and Native, are scarce during the rainy season.

The different ways of preparing the vegetable in Bengal are:—(1) The entire gourd is scraped and fried in butter or oil without removing the seeds. (2) The entire gourd is scraped, cut in halves lengthwise and fried with seeds. (3) The entire gourd is scraped, the seeds are removed by a long incision and the inside is stuffed with minced meat and spices and fried. (4) The skin is peeled, the seeds are removed and the gourd is cut in halves lengthwise or into smaller pieces and fried. (5) The skin is peeled, the seeds are removed, and the gourd is cut into circular or semi-circular pieces and fried. The gourd is precisely similar in shape and size to the Bombay variety* which is, however, poisonous; whereas this is a most

* There is no Bombay variety of this plant as far as I know. Col. Peters' plant now shown is strictly a native of Eastern Bengal and Assam. The poisonous plant described by me is *T. cucumerina* (see in our Journal, Plate E., letter press Part iv, of my Poisonous Plants of Bombay.

useful kitchen vegetable and much appreciated by the native population, who also use the tender leaves and stalks as a vegetable, especially recommended by *Vaidyas* as an appetiser to invalids when recovering from fevers. The root is also used as a cathartic." Here ends Col. Peters' interesting note.

The only counterparts of Col. Peters' Eastern Bengal edible plant *T. dioica*, Roxb., on this side of India are the popularly called Tondlen, (*Cephalanden indica*, Naud.) and the Snake-Gourd, *Trichosanthes anguina* which are found all over the Dekkan and the Konkan. They are greatly appreciated as highly valuable and dainty vegetables. They are mostly found in the rainy season; and even now, after the rains. Besides being cooked in the various ways described by Col. Peters, we cook our Tondlen with rice mixed with spices. The dish turned out serves as a valuable morsel to Hindus on festive occasions even in humble homes, as well as at quiet homely dinner parties. I show a specimen of the fruit, which is smaller than that of Col. Peters' plant *T. dioica*, Roxb. The snake-gourd is also used in several ways in Indian homes. Whether it will be relished at an English table is a matter of acquired taste.

K. R. KIRTIKAR, Lt.-Col.,
1. M. S. (Ret.)

ANDHERI, SALSETTE,
Januray 1912.

No. XLIX.—NOTES ON THE FLORA OF THE VALE
OF KASHMIR.

The Kashmir State, like ancient Gaul, is divided into three parts, the northern province of Baltistan with the mighty Nanga Parbat on the west, 26,229 feet high, towering over the whole State, Ladakh on the east with its many elevated plains, and Nun Kun, 23,447 feet in height, also on its left flank, then Kashmir on the south with the River Jhelum running across it, Kolahoi, 17,839 feet over the Lidar Valley, and Haramouk, 16,908 feet over the Sind Valley, while on the south is the Pir Panjal Range, with such giants as Tatakuti, 16,624 feet, and Brahma Sakal, 17,590 feet high, forming the highest peaks.

The Province of Kashmir is entered from the west at Kohala below Murree, where the ground level on the banks of the Jhelum is 2,050 feet above mean sea level; the cart road into the State follows the lead of the river to Baramula, running due north for 21 miles to Domel, then roughly to the east for 40 miles to Uri, the level being about 4,000, and 29 miles more to Baramula, where the Valley of Kashmir is entered at a base-level of 5,170. Srinagar lies 33 miles to the east, in the centre of the Valley, at

a level of 5,235, and Islamabad 32 miles farther on at a level of 5,385 feet, where several streams join to form the River Jhelum. On the east of the province are the Lidar and Sind Valleys, the centres of which are Pailgam at 7,200 feet, and Sonamarg at 8,600 feet, the latter so called because the rays of the morning sun shining on the ragwort, dandelions, buttercups, marsh-marigold, and potentillas that clothe its slopes, give it the appearance of a veritable "field of the cloth of gold." To the north lies Nagmarg at an elevation of 8,700 feet, with the Lolab Valley below at a level of about 5,700, and on the west Gulmarg, "the meadow of flowers," a little Valley on the eastern slopes of the Pir Panjal Range, at a height of 8,400 feet, having another meadow Kilanmarg above it at a level of 10,000 feet, the whole surmounted by Apharwat, 14,800 feet high, at the north end of the hills. Thus the flora of the Vale of Kashmir have a range of between 2,000 and 15,000 feet above mean sea level, and species of almost every order and genus of flora are to be found in the valley.

Going up the cart road at the end of April, the ravines of the Jhelum will be found covered with pink and red blossomed oleander, *Nerium odorum*, and a number of wild fruit trees lining the road, such as the large red-flowered pomegranate, *Punica granatum*; pink crab-apple, *Pyrus baccata*; white pear, *P. Pashia*; pink plum, *Prunus Puddum*, and almond, *P. amygdalus*; white cherry, *P. cerasus*; fig, *Ficus Roxburghii*, and olive, *Elacagnus umbellata*, also the mulberry, *Morus alla*, with its long red and white fruit, and *M. serrata* with its smaller purple fruit. The avenues of the valley road from Baramula to Srinagar, and those in the capital itself, are of the tall poplar, *Populus ciliata*, the thick white pollen of which coats the ground so extensively in the early spring as to give it the appearance of having been snowed on.

After the winter frosts have passed, the first flowers to bloom after the snows melt are yellow primroses, *Primula floribunda*, and purple many-headed primulas, *P. denticulata*, also the bright hued lilac iris, *I. nepalensis*, so characteristic of the village cemeteries of Kashmir, purple and yellow loosestrife, *Lysimachia chenopodioides*, and *L. japonica*, the little purple blue-tinged androsace, *A. lanuginosa*; pink centunculus, *C. tenellus*; the bright blue pimpernel, *Anayallis arvensis*, and the small flowered myrtles, *Myrsine semiserrata* and *africana*. With the advance of spring are to be found on the higher margs the white blossoms of podophyllum, *P. Emodi*, which later turn into large scarlet berries; yellow *Corydalis Govaniana*, and purple *C. rutafolia*; yellow tower-mustard, *Arabis glabra*, and the white variety, *A. amplexicaulis*; yellow and white aromatic leaved skimmia, *S. laureola*, the berries of which first turn green then red; white *Staphylea Emodi*; purple clover, *Trifolium pratense*; white pink-edged Dutch clover, *T. repens*; the small yellow *Trigonella pubescens*; delicate white spiraea, *S. vestita*; pink bramble, *Rubus niveus*, and the white species, *R. macilentus*; the white wild

strawberry, *Fragaria vesca*, and the yellow *F. indica*; white and red roses *Rosa sericea* and *R. macrophylla*, the fruit of which is bright red; white *Deutzia staminea*; pink and white *Viburnum fatens*; white pink edged Aaron's Rod, *Ainslia aptera*; white *Gerbera lanuginosa*; yellow ox-tongue, *Crepis fatida*; yellow *Salvia glutinosa*; blue *S. lanata*; blue mint, *Nepeta campestris*, and the pink variety, *N. ciliaris*; purple *Brunella vulgaris*; pink corn snap-dragon, *Antirrhinum Orlontium*; and many veronicas, blue *V. biloba*, purple and white *V. serpyllifolia*.

At a lower range are climbing clematis, white *C. montana*, purple *C. barbellata*, and yellow *C. Gouriana*; white purple tinged anemones, *A. rivularis*; white meadow-rue, *Thalictrum pedunculatum*; brilliant red *Adonis vernalis*; the bright yellow buttercup, *Ranunculus hirtellus*; white columbine, *Aquilegia pubiflora*; blue larkspur, *Delphinium denudatum*; yellow marble watercress, *Nasturtium palustre*; white cress, *Cardamine impatiens*; yellow cress, *Sisymbrium Wallichii*; the yellow and purple violet, *V. biflora* and *V. canescens*; St. John's wort, *Hypericum perforatum*; yellow *Reinwardtia trigyna*; pink geranium, *G. lucidum*; yellow *Oxalis corniculata*; white *Rhus punjabensis*; white *Osmorhiza Claytoni*; white chervil, *Anthriscus nemorosa*; yellow *Lactuca scariola*; yellow and purple dandelions, *Taraxacum officinale*; the white jessamine, *J. officinale*; white pink tipped *Lathraea squamosa*; the vervain, *Verbena officinalis*; white *Litsea consimilis*, and the yellow star of Bethlelehem, *Gagea persica*.

By summer time, on the heights are to be found the white flowered baneberry, *Actæa spicata*; red or white peonies *Pænia Emodi*; yellow barberry, *Berberis lycium*, with later violet berries; orange coloured *Erysimum hieracifolium*; white *Eutrema primulaefolium*; white hedge-garlic, *Sisymbrium alliaria*; pretty pink *Dianthus angulatus*; white chickweed, *Cerastium vulgatum*; pink or white *Dictamnus albus*; white flowered holly, *Ilex diphyrena*; dark violet lupin, *Thermopsis barbata*; dark purple-red *Indigofera gerardiana*; yellow *Potentilla albifolia* and crimson *P. nepalensis*; yellow agrimony, *Agrimonia eupatorium*; white *Cotoneaster acuminata*, with its subsequent long bright red berries; white orange-scented *Philadelphus coronarius*; green black currants, *Ribes nigrum*, and red currants, *R. rubrum*; white stonecrop, *Sedum linearifolium*, and the pink species, *S. trifidum*; yellow *Pimpinella acuminata*; white or red *Chærophyllum acuminatum*; white celery-leaved aromatic *Selenium vaginatum*; white and purple angelica, *A. glauca*; white *Heracleum cacherimicum*; pink and white *Abeia triflora*; the Alpine woolly edelweiss, *Leontopodium alpinum*; woolly white or yellow *Anaphalis nubigena*; downy yellow *Hieracium vulgatum*; yellow sowthistle, *Sonchus oleraceus*; the pink rhododendron, *R. campanulatum*; yellow *Chrysosplenium tenellum*; white privet, *Ligustrum compactum*; the small yellow cynanchum, *C. glaucum*, and green-purple *Scrophularia calycina*; lilac yellow-tinged eye-bright, *Euphrasia officinalis*; purple wild thyme, *Thymus serpyllum*; blue *Salvia lanata* and

yellow *S. glutinosa*; pink motherwort, *Leonurus cardiaca*; yellow spurge *Euphorbia pilosa* and yellow-green calanthe *C. tricarinata*.

At a lower level during the summer are seen white flowers of *Gypsophila cerastoides* and *Arenaria orbiculata*; lilac mallow, *Malva silvestris*; yellow and pink argyrobium, *A. flaccidum* and *roseum*; pink or white *Tillaea pentandra*; yellow *Datisca cannabina*; the marsh pennywort, *Hydrocotyle javanica*, and hare's ear, *Bupleurum tenue*; bright yellow cudweed, *Gnaphalium luteocalbum*; purple and white convolvulus, *C. arvensis*; blue or white *Evolvulus alsinoides*; white nightshade with black berries, *Solanum nigrum* and the purple species with red berries, *S. dulcamara*; yellow or blue wild gooseberry, *Physalis minima*; the white trumpet-shaped datura, *D. stramonium*; yellow-mullein, *Verbascum Thapsus*, and celsia, *C. coromandeliana*; delicate rains' plants such as blue *Platystemma violoides*, purple *Chirita pumila*, and white *Didissandra lanuginosa*. Many varieties of skull-cap blossom in the monsoon, yellow *Scutellaria angulosa*, and dark blue *S. grossa*, also the white purple-spotted *Plectranthus Gerardianus*. In August the Dal Lake near Srinagar will be found covered with large white and rose-coloured lotus flowers, *Nelumbium speciosum*, which are tended for religious services and reach a diameter of ten inches.

Towards the end of the summer are found on the higher ranges the light and dark neutral-tinted flowers of monkshood, *Aconitum heterophyllum*, and at greater elevations the small purple variety of aconite *A. Lycotonum*; pink *Silene tenuis* and white *S. Griffithii*; pink milkwort, *Polygala triphylla*; the purple species *P. crotalaroides*, and the yellow, *P. chinensis*; purple and yellow *Lychnis fimbriata*; white star-like *Stellaria paniculata*; purple *Geranium divaricatum*; yellow lucern, *Medicago falcata*, and senna, *Colutea nepalensis*; bright yellow *Caragana brevispina*; lilac and yellow *Astragalus chlorostachys*; red vetch, *Vicia rigidula*; bright yellow *Geum elatum*; yellow saxifrage, *S. filicaulis*, and the pink *S. ciliata*; lilac willow-herb, *Epilobium brevifolium*; small white *Circæa cordata*, and the handsome yellow *Morina Coulteriana*. Two species of aster are found with purple ray flowers and yellow discs, *A. molliuscellus* and *A. asperulus*; yellow elecampane, *Inula cuspidata*; pink milfoil, *Achillea millefolium*; yellow *Senecio graciliflorus*, and many purple and lilac thistles, *Echinops cornigerus* and *E. niveus*, *Arctium Lappa*, *Cnicus arvensis*, and *Serratula pallida*. The pretty *Prenanthes violæfolia* flowers late, also the white *Monotropa uniflora*; blue gentians are common from July onwards, *G. capitata*, *G. contorta*, and *G. Kurroo*, also the pale blue halenia, *H. elliptica*, and *Paracaryum glochidiatum*. The blue and yellow forget-me-not, *Myosotis caespitosa*, is found everywhere and the forest variety, *M. sylvatica*, is found in the woods from 6,000 to 9,000 feet height; pale purple yellow-tinged nightshade, *Atropa belladonna* and yellow purple-veined henbane, *Hyoscyamus niger*, are frequently met with. Also pink and white polygonums of many species.

At lower elevations during the early Autumn are found the white anemone flowers, *A. polyanthes*; yellow buttercups, *Ranunculus diffusus*; white honey-lotus, *Melilotus alba*; the handsome light yellow *Lespedeza juncea*; yellow purple-lined *Æschynomene indica* and bluish *Smithia ciliata*; purple *Uraria neglecta*; pink *Desmodium podæarpum*; pink and red *Vigna vexillata*; yellow *Atylosia platycarpa*; yellow purple-veined *Rhynchosia himalensis*, and pink or white *Flemingia fruticulosa*; white sundew, *Drosera lunata*; purple or white *Erigeron*; the strong-scented yellow *Carpesium abrotanoides* used to dye silk; the bur-marigold, *Bidens pilosa*; yellow and purple wormwood, *Artemisia Absinthium*; blue *Mazus rugosus*; yellow *Sopubia trifida*; pink *Amphicome arguta*; green and purple *Achyranthes aspera*; blue *Strobilanthes glutinosus*, and red-purple *Justicia pubigera*.

No mention can be made of the flora of Kashmir without including the trees, the finest of them is the *chenar* plane, *Platanus orientalis*, which attains a great height and girth; it was introduced by the Emperor Jehangir from Persia early in the Seventeenth century and is now to be found all over the valley; it buds in April, blooms in May, and in October the five-pointed leaves turn from green to the richest red and yellow colours. The walnut, *Juglans regia*, is also a splendid tree, the green flower appearing in May, and the two-valved nut ripening in September. The box tree, *Buxus sempervirens*, is found at a height of about 6,000 feet in cold damp glens facing the north; its yellow-green flowers are to be seen in April and the small seeds in October. The *deodar*, *Cedrus deodara*, a variety of the cedar of Lebanon; the common pine, *Pinus longifolia*; the horsechestnut, *Æsculus indica*; the hawthorn, *Cratægus oxyacantha*, and the bay-tree, *Daphne oleoides*, range from 5,000 to 7,000 feet; above them the blue pine, *Pinus excelsa*; silver fir, *Picea morinda*, and at 10,500 feet, the very top of the forests, *Abies Webbiana*, the dark foliage of which gives the name *Kala ban*, black forest, to the neighbourhood, and among these trees is found the white barked birch, *Betula utilis*. The common ivy, *Hedera helix* is found above 6,000 feet; its autumn greenish flower and winter black yellow and red berries make it quite a feature of the woods in those seasons. There are 10 genera of ferns and about 80 species to be found commonly in the valley, a complete list of which was included in a little book called "Hints on travelling in Kashmir," published by the Pioneer Press, Allahabad, that in addition gives much useful advice for visitors to the State.

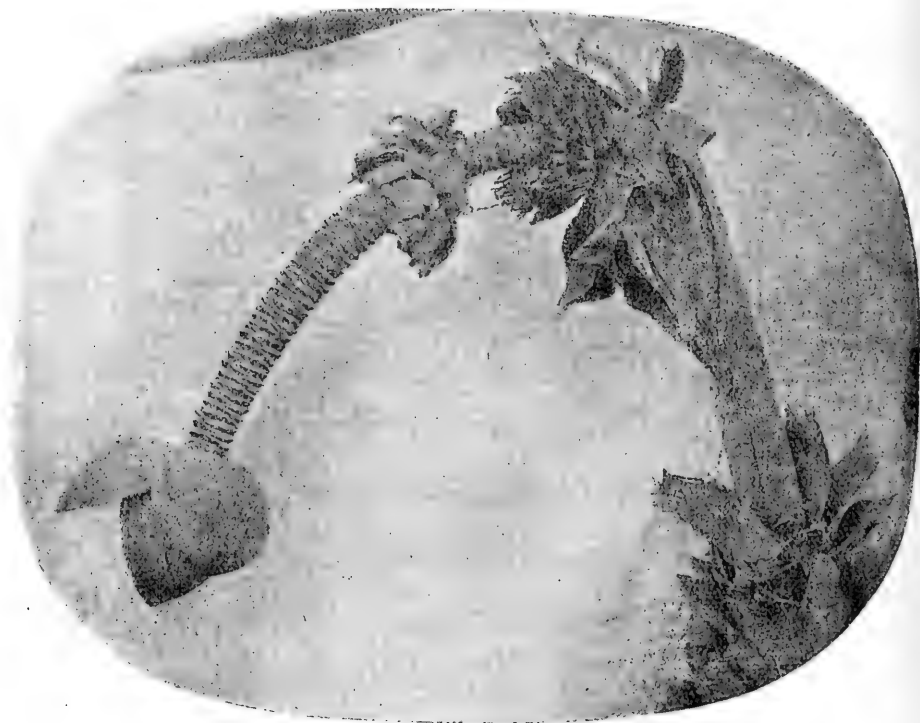
Kashmir is considered a place where a summer can be pleasantly spent in shooting, painting its lovely scenery, or playing polo and the fascinating game of golf, but the varied richly-coloured wild flowers are also a great attraction, though one is no botanist, and its geological features are full of interest even for an amateur in the science.

J. H. A. IVENS.

23rd September 1911.

No. L.—SECOND YEAR'S GROWTH OF A PLANTAIN
INFLORESCENCE.

The accompanying photograph is of a specimen of the wild plantain, *Musa superba*, at present in the garden of the bungalow, 3, Ganeshkhind Road, Poona. The plant in question was put in the ground as a sucker in 1908. In the rains of 1910 it produced its inflorescence and formed several small fruits. Then it remained dormant until the rains of 1911 when the inflorescence again started into growth and has not yet ceased to grow. No leaves, however, were produced this year, all growth being in the inflorescence. The bracts which have been formed this year contained, as far as I have observed, only staminate flowers with rudimentary ovaries—the normal condition of flowers at the tip of the flowering shoot of the plantain.



Plantain inflorescence (Burns).

The measurements of the plant are as follows:—Diameter of stump, 40 cm. Height of stump, 55 cm. Length between top of stump and bunch of

1910 fruits, 40 cm. Growth beyond this produced in 1910, 19 cm. Growth produced in 1911 (to base of bud), 38 cm. Present length of terminal bud, 14 cm.

I have seen a similar case in a wild plantain in the Botanical Garden, Bassein, and should like to know if it is at all common in wild plantains, and if it has been observed in cultivated plantains.

W. BURNS,

AGRICULTURAL COLLEGE,
POONA, 21st September 1911.

Economic Botanist, Poona.

No. LI.—A FLY TRAP (*BOUCEROSIA CRENULATA*, WIGHT & ARN.).

On 4th November 1911, I came across a flowering specimen of the Asclepiad plant, *Boucerosia crenulata*, which had successfully entrapped a common fly in the corolla of one of its flowers. The fly was very firmly held, whether by the hairs of the surface or partly by the natural viscosity of the flowers of this order I am uncertain, but I think by the former, for on arrival at home after a long walk I released the captive which flew away quite happily. I send you this note as I have not seen the sensitiveness of this genus recorded anywhere and do not know whether it is usual or not.

PYAWBE, 8th December 1911.

F. E. W. VENNING, CAPT.

No. LII.—NOTE ON *MACROCHLAMYS* (*EURYCHLAMYS*) *PLATYCHLAMYS* (BLANFORD), ETC.

[From the 'PROCEEDINGS OF THE MALACOLOGICAL SOCIETY,' Vol. IX,
Part V, June, 1911.]

It has been suggested that the following notes on the habits of this small mollusc, made by me in Bombay about 1898, may be of interest. The animal is of a bluish colour, the horn on the mucous pore is well marked, and the mantle has two broad shell-polishing lobes, each about a quarter of an inch long, one protruding backwards and the other forwards, over the shells.

It is most lively in very damp weather, and crawls at an astonishing pace, but if allowed to get dry, when in captivity, dies immediately. It is distinctly carnivorous; a *Succinea*, crushed by accident in its presence, was devoured on the spot.

Ariophanta bajadera (Pfeiffer), a much larger species, was attacked while crawling on my table. The *Macrochlamys* climbed on to its shell and bit it savagely on the back. The *Ariophanta* got rid of its assailant by swinging its shell from side to side. On one occasion a specimen hung from my finger by a thread of mucous 3 inches long; at this point I unfortunately

let him touch the ground, so did not discover how much longer he might have made his thread.

Macrochlamys pedina (Bens.), one of the commonest Bombay snails, is also carnivorous. I have seen them engaged in a cannibal feast over dead comrades crushed in the road, and have also seen one busy on the half-emptied shell of *Ariophanta laxipes* (Müll.).

I regret that I did not pursue these investigations further. Specimens of *M. platychlamys* were scarce, and I was more interested at the time in collecting good specimens of the shells than in observing the habits of the beasts.

A. J. PEILE.

NO. LIII.—CONCHOLOGICAL NOTES FROM BOMBAY.

BY LIONEL E. ADAMS, B.A.

(Reprinted from the *Journal of Conchology*.)

From Durban we went to Bombay, where, from an exclusively conchological point of view, we arrived at the best time of the year to find land and freshwater species, *viz.*, during the South-West Monsoon, when the earth is moistened and pools form. On this occasion the earth was quite sufficiently moistened for my purpose, for during the night of our arrival thirteen inches of rain fell in eleven hours—a record that even Manchester might be proud of. I spent much time in the Natural History Museum, which is an ideal provincial Museum, the exhibits being restricted to the fauna of the country, and arranged on British Museum lines. The collections are copiously labelled, and immaculate as regards dust and mould. I owe much to the Curator, Mr. Kinnear, and the Secretary of the Bombay Natural History Society, Mr. Millard, for the trouble they took to procure me specimens and advise me how to procure others for myself. Acting on their advice, I took a trip up the Ghauts to Igatpuri, where I spent a short but satisfactory time among the snails. It was only possible to hunt between the deluges which continued the whole time with intervals of sometimes half an hour. The most abundant species here was the sinistral *Nanina bajadera*, Pfr., which swarmed along a wall close to the dak bungalow where I was staying. In the town of Bombay, along Malabar Hill, about a quarter of a mile from the sea, in Mr. Millard's garden, were found considerable numbers of one (if not two) species of *Onchidium*, which I regret being still unable to name. *Nanina laxipes*, Müll, and *Macrochlamys pedina* were not uncommon in the same locality, and one species of *Ampullaria* was plentiful in a certain piece of water.

Snail-hunting in India has distinct drawbacks. In dry weather it is useless, and in wet weather it is sometimes impossible and always uncomfortable.

No. LIV.—NOTES ON THE CUTCH AMMONITES.

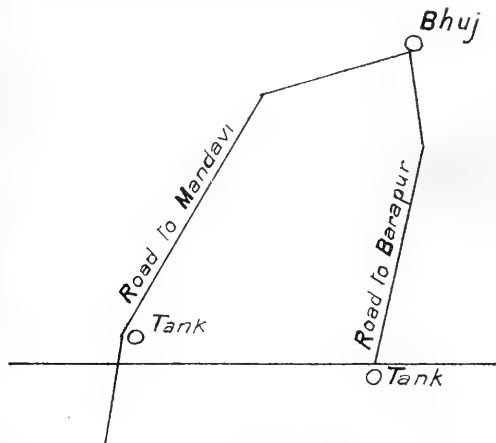
(With a Plate.)

About four miles from Bhuj there runs a belt of low hills rich in Belemnites and Ammonites, to say nothing of *Terebratulæ*, *Cardia*, *Pleurotomariæ* et hoc genus omne. This belt extends for over four miles without a break, running generally west to east. It extends further still, after breaks, but for the present article, this section of four miles will be considered.

As you approach Bhuj from Mandvi, at a point six miles from Bhuj, you will find yourself at the top of the pass of the Charwar hills. From its summit, you look down across a broad plain, in the centre of which the Palace tower rises clear and high above the masses of surrounding greenery which ensconce the city. To your right and left runs the long Charwar range in a steady line, golden yellow against the azure sky—with numerous ridges and foothills along the northern base.

A short way down the descent, the road carries you through a cutting and across a bridge. This cutting is the ridge of which I write. In spite of the frowns and gibes of scientific terminologists, I call it the Belteram ridge: why? because it is full of Belemnites, *Terebratulæ* and Ammonites. It is well worth the close study of a palæontologist.

Now take the following sketch, and you will easily find the limits of my Belteram range. It is indicated by the cross line.

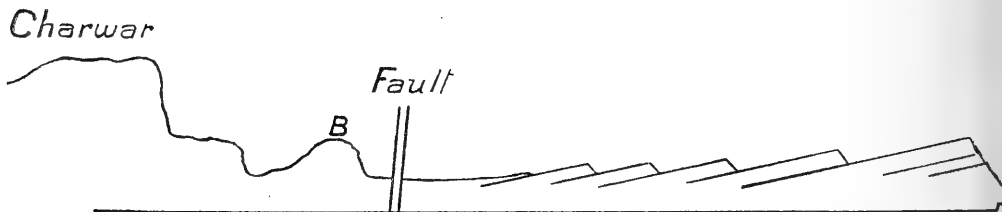


Roughly speaking it has an average width from north to south of 250 yards, but as the strata are tilted at 30° or so, the actual perpendicular thickness of the belt as deposited would be about 600 feet, at each end of the line the belt subsides into the plain to east and west. Nullas which run across its supposed track beyond each end, show no trace of it. It has vanished down below.

Now reverse things. Approach the Belteram ridge from the Bhuj side. You go across a fairly level plain, with a few insignificant ridges, dipping slightly south and scarped north. The main substance of the ground, as shown by nullas, is a friable coarse white sandstone, but the surface is mostly of yellow or of red, being littered with small smooth stones (not water worn) or levelled by rain and cultivation. On ahead of you is the belt of the Charwar range (Kir-giri the Cutchis used to call it in this part of its length), rising to 400 or 500 feet over the plain. Lines of dunes and ridges fringe its northern base. The Charwar range is mainly of yellowish shale; but in parts masses of whitish and purplish and blackened sandstone form its upper main strata. The foothills too are mainly of shale; but the first big ridge you come to (ignore the broken belt of black and white sandstone for the present) is of a warm old-gold colour—a soft golden yellow, here and there blackened by exposure. This is our Belteram.

Blanford suggested a fault all along this line, and Wynne and Fedden verified it. The white sandstone of the plain is believed to belong to an Upper Jurrassic age: the Belteram and its backing hills to a Lower Jurassic. That is to say, if the theory is correct, the white sandstone rocks of the plain were at one time much higher than the tops of the 400 feet high hills beyond, but by reason of the Titanic motions of the earth's crust in prehistoric days, either the upper strata have here sunk or the lower strata have been raised. That this change should have been effected by a convulsion I think is hardly probable, for the level of the plain is so smooth, its exposed reefs so regular, and the strata of the hills and ridges to the south of the fault are so even that there is no sign of a great convulsion. I see that the survey reports the rocks to the south of the fault to be much contorted; but the contortions have mainly assumed the regular form which I am going to describe. To my untrained mind the subsidence or elevation was probably gradual. But it was not a matter of 400 feet only.

The plain as mentioned above shows ridges, each riding on the back of its northern forerunner. Going north you pass ridge after ridge, each sloping up from the south and scarped on the north side.



These little ridges are of highly coloured sandstone, and further north beyond Bhuj develop into shale, forming the cliffs of the deep Kari River nulla, and the Dhonsar hills beyond, *i.e.*, 8 miles north. Beyond Dhonsar there outcrops again the warm yellow belt of Belteram. The thickness of shale and sandstone between the belts has been adjudged to be 3,000 feet. So if this fault theory is correct (and it seems very probably so) we must allow for a slip of 3,000 feet. Probably in those far-off days, the Ammonites and their kin thought nothing of a subsidence of 1,000 yards. I may say that Wynne and Fedden found these belteram beds to be the lowest exposed rocks of Cutch. They occur again north of Dhonsar, also along the north coast of Cutch, and again in the Runn islands.

To my mind (which is, I admit, amateurish, though keen) there are several puzzles in the theory, *e.g.*, one is this: if the white sandstone represents the higher strata, how is it that one finds a white sandstone hill at the north edge of the fault with a cap of solid belteram rocks. The hill is 50 or 60 feet above the nearest belteram. Again how is it that you find scattered over the surface soil of the plain north of the fault, limestones with terebratulæ, belemnites and sometimes ammonites. These are spread over perhaps half a mile of the plain (northwards). I have found one such limestone within 200 yards of my bungalow, four miles north and one, a mile north of my bungalow. If, after the occurrence of the fault, the sea denuded the north cliffs of the Belteram it may have spread much of the stuff over the plain, but I should not care to have been out sailing in the storm which carried a block of this limestone, weighing about one cwt. a mile north of the ridge.

Again, how is it that if life was so prolific in the age of the deposition of the belteram beds, hardly any life seems to have existed in the centuries during which several hundred feet of shale and sandstone were being deposited above it, and yet a few ammonites have, it seems, been found on the summit of the Charwar hills. I found one forlorn belemnite near the top of the highest hill of the range; poor fellow; he can have had no club to go to; and I don't see how it is that if one belemnite could be preserved by the nature of the ooze in which he died, several of his fellows couldn't be preserved too.

If the life of the Belteram period died out with the formation of its upper deposits, how could the race of ammonites be preserved for the deposits which were formed so much later. The shale and hard limestone slabs which succeeded the Belteram period seem to lie conformably on the Belteram, *i.e.*, they were deposited at the bottom of their sea in unbroken succession to the Belteram strata. As you passed through the pass of the Charwar range, you could have seen its shaly and limestone strata all dipping south at about 28° , which corresponds to the dip of the Belteram beds just below there.

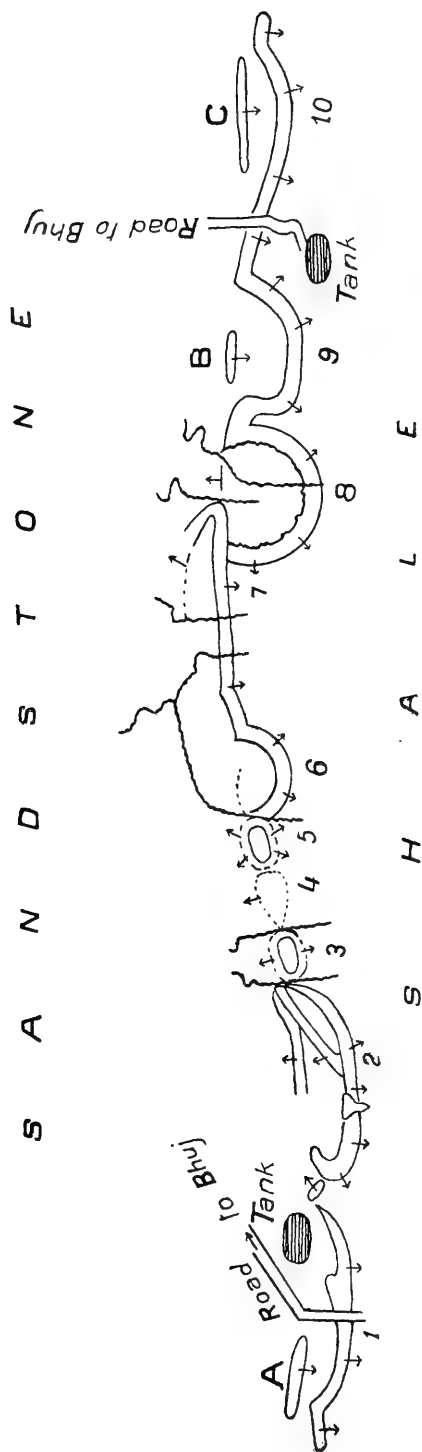
I have examined the Belteram with what an untrained eye considers to be considerable care. It is not all a case of south dip and north scarp, the latter overhanging the plain. There was a regular range of long narrow round topped hills; the north slope of the anticline has gone in some places, but in others its traces are visible, so that here and there the dip of the Belteram nearest to the plain is to the north. Unfortunately at the points where the white sandstone comes visibly in contact with the Belteram, the former is so powdered and broken and fragments of both kinds seem so mixed that one can't see exactly what happens when the two dips come into conflict. In places high masses of brecciated alluvium cap the sandstone, as if washed down from the Belteram ridge by the flow of a sea or river and deposited over the sea's white sandy bed.

Beginning from the uprise of the Belteram at its west extremity, I find the belt pretty wide here, dipping south and scarped north, with a vanguard ridge of detached dark crimson hills some 200 yards in front of its slope. This vanguard ridge dips deep south and evidently underruns the main belteram beds. It too is of Belteram—but of a harder and coarser material, with fewer fossils in evidence. The plain comes up to the foot of the scarp of the vanguard, and I can trace no sign of my supposed anticline, though the debris on the plain extends some way. Perhaps this anticlinal hill was broken clean in half by the fault.

To the east of Wala Khawas Tank, the belteram shows a long elliptical hill with a west dip of strata on its west flank, north dip on its north and south dip on its south. All the centre has been eroded; and the west and north sides of the anticline have been eaten away and reduced much more than the high south ridge.

Beyond a nulla, I find another circular hill, dipping outwards on all sides, also eroded in the centre. Then a long mound, probably the relics of another round hill quite eroded, leads up to another circular hill, whose strata dip outwards on all sides. A deep nulla defines its eastern slope and a fourth circular hill supervenes, its north side mostly vanished. Then a long ridge, the south side of a quondam elliptical hill, for after travelling along the ridge for 1,000 yards, I note a slight outcrop, 150 yards to the north, of belteram dipping north and gradually rising and curving in to join my ridge, and beyond its junction the strata dips round eastwards. Here it is that just to the north of the fault lies the broad squat hill—60 feet high—of white sandstone carrying its cap of belteram.

But a peculiar sight to the south of this point is a great bowl 600 yards across, its sides made of yellow belteram ridges. The bowl is like its name, its ragged and jagged and jutting edges rising some 20 or 50 feet all round, all dipping outwards. Even the north side of it dips outwards, its strata clashing with those of the main ridge which we have been following. Evidently it was once a great cone of belteram—now all eroded—and



NOTES ON CATCH AMMONITES.

its soft yellow rocks melting year by year, their square broken debris lying tumbled round the sides of the bowl. A stream, dry most of the year, drains it and carries off the melted ingredients to feed the plain beyond.

I continue along my ridge, and come to a great semi-circle, sweeping round by the south, all scarped on its more northerly side, with tumbled debris, all its sides dipping outwards—apparently another quondam conical hill. The semi-circle is 800 yards in diameter. The north side of the old cone is clean gone; but standing out in front to shelter the hollowed line is another vanguard hill dipping deep south, just like the first vanguard hill did. This vanguard hill again is of harder and coarser texture and preserves its fossils tightly; much of it is of volite with minute molluscs engrained.

I cross the semi-circle and pick up my ridge again and continue across the Barapur Road; but here again rises a third vanguard hill, protecting a southerly curve of the main ridge. It is of the same material and ill preserved fossils as its vanguard predecessors. This vanguard and the line of the ridge behind curve on to a point some 800 yards on, and then both sink away, vanguard and main body, and subside under the plain of shale and sandstone. A nulla a little way on shows no trace of belteram; in its walls one sees the shale of the south and the white sandstone of the north brought into summary contact; the shale has come off worst; its proud thin lines of serried strata are here crumpled up and precipitated headlong downwards.

I do not know how far geologists have noticed this peculiar chain of rounded hills; I do not see it specially mentioned in the Geological Survey Memoirs, and I have not got Stoliczka's records. But it has seemed to me worth notice, especially as the chain of curves, circles, semi-circles, &c., is composed entirely of belteram, and beyond it to the south, where the harder rocks or the shale overlie the belteram outcrops, you get a cessation, or anyhow a famine, of fossils.

The belteram beds are full of palæontological interest apart from their geological setting. Fossils abound—*terebratulæ*, small and big; *thynconellæ*; *pleurotomariæ*, *ostreæ*, and many other molluscs; but the ammonites alone are a delight in themselves. I have got from this ridge what I take to be over 40 different species, probably more than 50. I have various species of *Phylloceras*, of *Oppeliæ*, of *Harpoceras*, of *Stephanoceras*, of *Peltoceras*, of *Aspidoceras*, and of *Perisphinctes*, *Haploceras* of *Amaltheus* I have not found. Identification of several species is a difficulty. I believe several to be new to Cutch. *Nautilus* have also been found.

Dr. Waagen who in 1871 wrote in the *Palæontologia Indica* (Ser. IX, I, Vol. I, Nos. 1, 2, 3, 4) on the Cutch Ammonites, illustrated and classified the specimens discovered by the Geological Survey; but it seems that he

did not himself visit Cutch, and I cannot tell to what zone of palæontology he would have assigned this bed. He speaks of the *Anceps* beds of Samatra, which is a village at the north foot of the Charwar hills and has probably the same strata as are here exposed; but I have found only one *Anceps* here. I am inclined to think he would more probably have classed it as *Dhosa Oolite*, *Asp. babeanum* is so fairly frequent. I should be glad to get into communication with some member of the B. N. H. S. who is keen on these matters and who can criticise and correct my errors, and will assist in the identification of the more doubtful specimens.

AMMONITES, &c., FOUND IN THE ABOVE BELT.

Nautilus—

kumagunensis.

kutchensis (?)

Phylloceras—

disputabile.

lodaiense.

mediterraneum.

Oppelia—

bicostata. (?)

orientalis.

kutchensis.

trachynota.

Aptychus of *oppelia*.

Harpoceras—

dynastes.

trilineatum.

hecticum. (?)

Peltoceras—

athleta.

(indeterminate).

Aspidoceras—

diversiforme.

pondesosum.

babeanum (frequent)

sub-distractum. (?)

wynnei. (?)

Stephanoceras—

macrocephalum. (?)

polyphemus.

maya.

tumidum.

fissum. (?)

transiens.

Perisphinctes—

paramorphus. (?)
pottingeri.
katrolensis.
torquatus.
bathyplocus.
frequens. (?)
virguloides.
martelli.
anceps.
alterneplicatus.
dhosænsis.
omphalodes.

Also some 7 or 8 other sorts which I cannot identify with any in Waagen's catalogue. The specimens being in many cases fragmentary or not showing lobes, I may have mistaken several of the above.

J. H. SMITH.

BHUJ, CUTCH, *December* 1911.

PROCEEDINGS.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 25th January 1912, at the Society's rooms, Mr. E. Comber presiding.

The election of the following 69 new members since the last meeting was duly announced :—

The Mess President, 2nd N. Staffordshire Regiment (Peshawar); Mr. C. C. Gilbert (Ratnapura, Ceylon); Lt. S. G. G. Fraser (Bangalore); Mr. J. F. B. Hartshorne, I.C.S. (Ahmedabad); Mr. W. T. Radford (Shahabad, Bengal); Mr. J. R. Coats, B. Sc., A.M.I.C.E. (Madras); Mr. R. T. Jones (Ferozepore); Staff-Surgeon R. B. Scribner, R. N., H. M. S. Alert (Persian Gulf); Lt. C. R. S. Pitman (Alipur); Mr. H. L. Wintle (Darjeeling); Mrs. W. H. Ogston (Bombay); Mr. Ashton James (Bijapur); Mr. W. H. Reed (Kadur District); Mr. R. R. Morgan (Tezpur, Assam); the Honorary Secretary, Club Library (Secunderabad); Major H. H. Norman, R.A.M.C., Shwebo (Burma); Mr. A. A. Biggs (Marmagoa); Mr. R. Dupont (Seychelles); Capt. B. N. Abbey (Burma); Capt. G. R. Balston, R. H. A. (Mhow, C. I.); the Secretary, Australian Museum (Sydney) Lt.-Col. C. E. Nichol, D.S.O., R.A.M.C. (Maymyo, Burma); Lt. A. D. Talbot (Multan, Punjab); Major W. B. Pearson (Multan, Punjab); Mr. A. L. Hannay, I.C.S. (Waltair, S. I.); Mr. A. H. Duke (Bangkok, Siam); Mr. L. D. G. Smyth (Katha District, Upper Burma); Mr. Basant Lal Gupta, B. Sc. (Lucknow); Lt. W. A. Nicholls, R.H.A. (Campbellpore); Mr. B. F. Cavanagh (Baroda); the Honorary Librarian Public Library, Lucknow; Mr. W. Denso (Bombay); Mr. W. P. Hulton (Gangarpur); Mr. M. Mackertich (Gulzarbagh); Capt. E. C. Taylor, I.M.S., Parachinar, N.W.F.P.; the Mess President, XI K. E. O. Lancers (Delhi); Mr. E. R. Atkins (Baheng, Siam); Mr. D. B. Binning (Bombay); Mr. H. A. Gilbert (Bombay); Mr. C. Gwyer, I.F.S. (Thayetmyo, L. Burma); Major R. Sparrow (Trimulgherry, Deccan); Mr. F. H. S. Stone (P. & O. S. N. Coy.); Mr. C. I. Hutton (Ywataung, Upper Burma); Mess President, 1st Battalion, the Royal Scots (Allahabad); Mess President, 62nd Punjabis (Benares); Mr. R. G. Marriott, I.F.S. (Haldwani, U. P.); Capt. G. R. Bird (Berbera, Somaliland); Mr. H. G. Turner (Taunton, England); Mr. A. C. Gale (Dharwar); Mr. L. E. Taylor (Dharwar); the Mess President, 7th Hussars (Bangalore); Mr. G. A. Skene (Thayetmyo, Burma); Capt. Sir G. D. S. Dunbar, Bart. (Lakhimpur, Assam); Mr. John Currer, Langla (S. Sylhet); Mr. C. H. Haldane (Mandalay); Lt. W. Weatherbe (Agra); Mr. L. C. Hobson (Dharwar); Mr. Geo. H. Ogilvie (Bavaria); Mr. W. K. Webb (Nagri Spur P. O.); Mr. W. L. Travers (Jalpaiguri); Mr. E. C. Gibson, I.C.S. (Saugor); Mr. M. R. G. Smith (Dharwar); Lt. W. A. P. Grey (Sagaing, Burma); Mr. A. Davison, P.W.D. (Raipur); Lt. J. E. M. Mellor (Amballa); Mr. Phirozsha Bomanji

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CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Gayal or Mithan, entire skin with head and horns.	Mishmi Expedition.	Capt. F. M. Bailey.
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1 Large Malay Squirrel	Kobo, Abor Expedition.	Major Sweet.
Do. do.	Dosing Valley, Abor Expedition.	Dr. J. Falkiner.
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1 Malabar Spiny Mouse ..	Mercara, Coorg ..	Mr. A. E. Alexander.
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1 Large Indian Pratincole	Shamshirnagar ..	Mr. G. Macrell.
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1 Yellow-eyed Babbler, albino ..	Thayetmyo	Mr. J. Pemberton Cook.
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13 Birds' skins	Chamba	Capt. J. E. Boyd.
124 Birds' eggs	Khasia Hills ..	Mr. E. C. Stuart Baker, F.Z.S.
10 Fresh water fishes	Koina & Krishna River.	Mr. W. A. Wallinger.
Several Fish and Shrimps	Dwarka	Capt. A. H. E. Mosse, I.A.
5 Gold Fish with 3 lobed tail (<i>alive</i>).	Shanghai	Mr. F. H. S. Stone.

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2 Siamese fighting-fish (<i>alive</i>) ..	Siam	Mr. Nigel Kerr.
3 Fresh water fish (<i>alive</i>)	Bombay	Do.
1 Sind Krait	Tochi Valley	Capt. E. C. Taylor.
1 Russel's Earth Snake	Poona	Capt. A. Delme Radeliffe.
1 Do. do.	Santa Cruz	Lt. F. J. Chadwick.
1 Brown Tree Snake (<i>alive</i>)	Do.	Col. J. Forbes.
1 Green Whip Snake (<i>alive</i>)	Bombay	Rev. F. Dreckmann, S.J.
1 Do. (Brown <i>var.</i>).. ..	Bhutan, Doars	Mr. H. V. O'Donel.
25 Snakes	Nelliampatti Hills	Mr. A. M. Kinloch.
14 Snakes and 8 Lizards	Various	Major F. Wall, I.M.S.
14 Snakes	Taungyi	Mr. S. St. C. Light- foot.
1 Cobra	Gaya, Bengal	Mr. J. Powell.
1 Cobra (skin 6 ft. 7 in. unskinned)	Shamshirnagar	Mr. H. V. O'Donel.
1 Cobra	Do.	Do.
1 Russel's Earth Snake	Manmad	Mr. E. Cooke.
1 Common Wolf Snake and 1 Buff Striped Keelback.	Andheri	Mr. F. H. S. Stone.
1 <i>Hypsirhina Sieboldi</i>	Nepal	Mr. F. Field.
1 King Crab	Singapore	Mr. F. H. S. Stone.
1 Piece of Gold Quartz	Australia	Do.
19 Butterflies	Singapore	Mr. P. Gerhardt.
68 Butterflies	Abor Expedition.. ..	Major Sweet.
1 Painted Bat	Thana District	Mr. C. E. L. Gilbert.
A number of fossils	Cutch	Mr. J. H. Smith.

The following collection had also been left to the Society by the late Major G. S. Rodon:—

Mounted heads.—1 gaur head; 3 heads of Chamba serow; 3 heads of Himalayan tahr; 3 heads of Nilgiri tahr; 4 heads of goral; 6 heads of chinkara; 9 heads of black buck; 3 heads of Himalayan ibex (two males and 1 female); 1 young female Hodgson's sheep; 2 heads of musk deer; 1 head of sambar; 1 head of nilgai; 1 head of Himalayan brown bear; 1 head of Himalayan black bear; 1 head of spotted deer; 1 head of Indian wild boar; 1 head of a langur, and 3 pairs of horns of spotted deer. Entire stuffed specimens:—2 brown bears; 1 wolf; 1 white-handed gibbon; 1 hooleck; 1 jackal; 4 mountain foxes; 1 common Indian fox; 1 pine marten; 2 Ward's mouse hares. Flat skins with stuffed heads:—3 Himalayan brown bears; 1 Himalayan black bear; 1 tiger; 1 fox; 1 langur. Flat skins:—1 spotted deer; 2 Himalayan tahr; 2 serows; 1 black bear; 2 Himalayan ibex; 1 young female Hodgson's sheep; 1 goral; 6 black buck; 3 chinkara; 1 wild dog; 2 musk deer. Birds mounted:—4 monauls; 2 chukor; 3 Koklas pheasants.

Minor contributions had been received from Messrs. E. Pearson, N. B. Kinnear, A. Wright, C. H. Dracott, J. F. Keddie, F. H. S. Stone, C. F. Hall, J. H. Smith, Col. A. Newnham, P. M. D. Sanderson, and W. Michael.

The following additions have been made to the library :—

“Familiar Indian Flowers” (coloured plates) by Lena Lewis (presented by Miss Phipson). “Contributions to Indian Ornithology,” No. 1, Cashmere, Ladak, Yarkand, by Hume (presented by Lt.-Col. A. Newnham). “Notes on Jerdon’s Mammals of India,” Anon, (presented by Lt.-Col. A. Newnham).

NEW MEMBERS REQUIRED.

The Secretary mentioned that at the present moment the Society only had about 150 members in Bombay out of a total of 1,500 members. He thought this number was considerably less than formerly and hoped that local members as well as up-country ones would try and induce others to join the Society. The annual subscription of Rs. 15 was smaller than any other Society he knew when one compared the value of the Journal which members received, the Society’s various collections of specimens in the Museum, and the library which contained many valuable books of reference. The subscription had not been increased for 25 years, although the Journal was now four times as large.

MAMMAL SURVEY.

Up to now 767 specimens had been collected by Mr. Crump in Khandesh, Cutch, the Berars and the Central Provinces and 503 specimens collected by Mr. Shortridge (in 2 months) in the Dharwar District. All of these had been forwarded to the British Museum for working out and the first report on them would appear in the next Journal. Some Rs. 23,000 had been collected, but about Rs. 7,000 had already been spent as the initial expenses were necessarily heavy and the Committee hoped that members would continue to support this fund, which was doing such good work. Already one new genus had been found and two new species, the descriptions of which would appear in the Journal.

The following papers were then read:—1. “Some Notes on Guests of Termites,” by the Rev. J. Assmuth, S.J. 2. “A Note on *Trichosanthes divica*,” by Lt.-Colonel K. R. Kirtikar, I.M.S. (Retd.)

CONTENTS OF THIS NUMBER—(contd.).

	PAGE
SOME BIRDS AND BIRDS' NESTS FROM HAKA, CHIN HILLS. By Capt. F. E. W. Venning	621
A NEW SNAKE <i>PSAMMOPHIS TRITICEUS</i> , FROM BALUCHISTAN. By Major F. Wall, I.M.S., C.M.Z.S.	634
DESCRIPTION OF A NEW SPECIES OF <i>ACMÆA</i> FROM BOMBAY, AND NOTES ON OTHER FORMS FROM THAT LOCALITY. By Edgar A. Smith, I.S.O.....	637
PROGRESS OF THE MAMMAL SURVEY. (With a Plate).	640
REVIEWS. "Forty years among the Wild Animals of India" and "Medical Entomology"	645
OBITUARY NOTICE. E. W. Oates	651
MISCELLANEOUS NOTES:—	
I.—The number of cubs in a tiger's litter. By C. R. S. Pitman	653
II.—The Stoat in Kashmir. By Major H. A. F. Magrath.	653
III.—A Deformed Thamin Stag (<i>Cervus eldi</i>). By A. H. D. Barron	654
IV.—Do. Chinkara (<i>Gazella bennetti</i>) drink water? By C. R. S. Pitman	655
V.—Indian Breeds of Sheep. By H. J. Elwes, F.R.S....	655
VI.—The Banting or Tsaing (<i>Bos sondaicus</i>). By A. Rodgers.....	656
VII.—The Colouration of Tigers. By C. R. S. Pitman	657
VIII.—A Deformed Head of the Four-horned Antelope. By C. R. S. Pitman	658
IX.—The Pintail Duck (<i>Dafila acuta</i>) shot in September. By Major H. A. F. Magrath	658
X.—Occurrence of European Striated Swallow (<i>Hirundo</i> <i>rufila</i>) in Kangra. By H. Whistler.....	659
XI.—Nidification of Tweeddale's Scimitar Babbler (<i>Poma- torhinus nuchalis</i>). By J. P. Cook	659
XII.—The Paradise Flycatcher (<i>Terpsiphone paradisi</i>). By Major H. A. F. Magrath	660
XIII.—The Crag Martin (<i>Ptyonoprogne rupestris</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.	660

CONTENTS OF THIS NUMBER—(contd.).

PAGE

MISCELLANEOUS NOTES—contd.

XIV.—Extension of the habitat of the Common Kingfisher (<i>Alcedo ispida</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.....	661
XV.—Note on the Common Kingfisher (<i>Alcedo ispida</i>). By Major H. A. F. Magrath	661
XVI.—The Notes of Pallas' Fishing Eagle (<i>Haliaëtus leucorhynchus</i>) and some water birds. By Major H. A. F. Magrath	662
XVII.—Immature plumage of Lammergeyer (<i>Gypaëtus barbatus</i>). By H. Whistler	663
XVIII.—Occurrence of the Goshawk (<i>Astur palumbarius</i>) in Sind. By Raymond W. Cooper	665
XIX.—Extension of the habitat of the Brahminy Kite (<i>Haliastur indus</i>). By P. T. L. Dodsworth, F.Z.S., M.B.O.U.....	665
XX.—The Painted Snipe (<i>Rostratula capensis</i>). By C. R. S. Pitman	666
XXI.—Painted Snipe (<i>Rostratula capensis</i>) in large numbers. By A. H. Kingston.....	667
XXII.—Record of Snipe shot at Hminelongyee, in the Chieng-mai District of Siam, from 1905 to 1910. By D. L. Keddie	667
XXIII.—Notes on some of the bird life at Thandoung. By J. P. Cook	668
XXIV.—Migration of Baya (<i>Ploceus baya</i>). By A. B. Punde ..	675
XXV.—The Maroon Oriole (<i>Oriolus trailii</i>). By Alex. M. Primrose	676
XXVI.—Wood Snipe (<i>Gallinago nemoricola</i>) occurring near Bangalore. By Lieut.-Col. R. M. Betham	677
XXVII.—Goose-shooting in Cutch. By Maharaj Kumar Shri Vijayarajji	678
XXVIII.—Falcons and their prey. By Lt.-Col. S. E. Prall, I.M.S.	680
XXIX.—On the occurrence of the Common Wood Shrike (<i>Tephrodornis pondicerianus</i>) and the Central Asian Black Bird (<i>Merula maxima</i>) near Peshawar. By Major H. A. F. Magrath	680

CONTENTS OF THIS NUMBER—(contd.).

	PAGE
MISCELLANEOUS NOTES—contd.	
XXX.—Habits, food and nesting of the Great Himalayan Barbet (<i>Megalenna marshallorum</i>). By P. T. L. Dods-worth, F.Z.S., M.B.O.U.	681
XXXI.—Marbled Duck at Baroda. By Lt.-Col. R. G. Burton	684
XXXII.—The Sooty Tern (<i>Sterna fuliginosa</i>) in Cachar. By E. C. Stuart Baker, F.Z.S., F.L.S.	684
XXXIII.—Notes on the Southern Migration of Snipe near Calcutta, 1911. By C. R. S. Pitman	684
XXXIV.—Occurrence of the Nukhta or Comb-duck (<i>Sarcidionis melanonota</i>) in Sind. By M. Webb, I.C.S.	685
XXXV.—The breeding of the false Himalayan Viper (<i>Psammodynastes pulverulentus</i>). By Major F. Wall, I.M.S., C.M.Z.S.	686
XXXVI.—Food of the Snake <i>Rhabdops bicolor</i> . By Major F. Wall, I.M.S., C.M.Z.S.	687
XXXVII.—The Diet of a Bull-frog (<i>Rana tigrina</i>). By S. P. Agharkar	687
XXXVIII.—Notes on the Indian Chamæleon (<i>Chamæleon calcaratus</i>). By C. Chenevix Trench, I.C.S.	687
XXXIX.—Snake eating a Snipe. By Capt. F. E. W. Venning.	689
XL.—Some notes on the hatching of the Agamoid Lizard (<i>Calotes jerdoni</i>). By Capt. F. E. W. Venning	690
XLI.—Breeding of Maclelland's Coral Snake (<i>Callophis maclellandi</i>). By Major F. Wall, I.M.S., C.M.Z.S.	693
XLII.—The Madras Aquarium. By Dr. N. Annandale	693
XLIII.—The Life of a Dog Tick. By Capt. W. J. Massy	694
XLIV.—Asiid Oviposition. By S. K. Sen	695
XLV.—Caterpillar Pest on Cotton in Khandesh. By R. S. Kasargode	698
XLVI.—Note on the Butterflies, <i>Lethe kansa</i> and <i>Dophla patala</i> . By G. W. V. DeRhé-Philipe, F.E.S.	698
XLVII.— <i>Papilio polytes</i> in Bangalore. By K. Kunhi Kannan.	699
XLVIII.—A Note on <i>Trichosanthes dioica</i> , Roxb. By Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.)	700
XLIX.—Notes on the Flora of the Vale of Kashmir. By J. H. A. Ivens	701

1082
1020

CONTENTS OF THIS NUMBER.—(concl'd.)

PAGE

MISCELLANEOUS NOTES—concl'd.

L.—Second years' growth of a Plantain Inflorescence. By W. Burns	706
LI.—A Fly Trap (<i>Boucerosia crenulata</i>). By Capt. F. E. W. Venning	707
LII.—Note on <i>Macrochlamys</i> (<i>Eurychlamys</i>) <i>platychlamys</i> , etc. By A. J. Peile	707
LIII.—Conchological Notes from Bombay. By Lionel E. Adams, B.A.	708
LIV.—Notes on the Cutch Ammonites (<i>With a Plate</i>). By J. H. Smith	709
PROCEEDINGS	716

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